HYDROELECTRIC REQUIREMENTS AND RESOURCES IN ALASKA

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON IRRIGATION AND RECLAMATION

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS UNITED STATES SENATE

EIGHTY-SIXTH CONGRESS

SECOND SESSION

ON

HYDROELECTRIC POWER REQUIREMENTS AND WATER RESOURCE DEVELOPMENT IN ALASKA

ANCHORAGE, ALASKA, SEPTEMBER 7, 1960
FAIRBANKS, ALASKA, SEPTEMBER 13, 1960
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LETTER OF TRANSMITTAL

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
December 6, 1960.

Hon. CLINTON P. ANDERSON,
Chairman, Subcommittee on Irrigation and Reclamation, Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: By letter of August 16, 1960, you designated me as acting chairman of your subcommittee to conduct a series of hearings on the hydroelectric requirements of Alaska. In accordance with your instructions, I sought the participation of other members of the committee, but all had previous commitments.

Under your authorization, I arranged a series of hearings and air flights in cooperation with the Air Force, Corps of Engineers, the Bureau of Reclamation, and the Coast Guard, which are covered more in detail in this letter and the attached material.

Highlights are as follows:

September 7, 1960, hearing at Anchorage, Alaska.

September 9, 1960, Air Force arranged flight from Elmendorf Air Force Base to Cooper Lake project, thence to Bradley Lake, up the Susitna River to near Talkeetna, where fog interrupted the flight over Devils Canyon project area. Returned to Elmendorf Airbase.

September 11, 1960, overflight of Susitna River to Talkeetna, thence up Chulitna River to Tokichitna Dam site, thence over the Susitna River and up to the Devils Canyon Dam site. From the Devils Canyon Dam site the flight was along the railroad to the Nenana River to Clear. In the afternoon the Rampart Dam site on the Yukon was inspected from the air, and the flight terminated at Ladd Air Force Base, Fairbanks.

September 13, 1960, hearings in Fairbanks.

September 14, 1960, overflights of Long Lake-Snettisham power project through courtesy of U.S. Bureau of Reclamation.

September 15, 1960, hearings in Juneau, Alaska.

September 16, 1960, overflight of Juneau Ice Cap through courtesy of United States Coast Guard.

Subsequent discussions with officials at Juneau, Ketchikan, and Wrangell.

Arrangements for the public hearings at Anchorage, Fairbanks, and Juneau were made with the cooperation of Mr. David L. Luce, Administrator of Federal Courts in Alaska, which is gratefully acknowledged.

A more complete report, together with my recommendations for consideration of your subcommittee and of the Committee on Public Works, is attached.

I appreciate the opportunities afforded by your assignment to me.

Sincerely,

ERNEST GRUENING, *Acting Chairman,*
Subcommittee on Irrigation and Reclamation.

RÉSUMÉ OF FINDINGS OF THE SUBCOMMITTEE ON IRRIGATION AND RECLAMATION OF THE SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS ON HYDROELECTRIC POWER REQUIREMENTS AND RESOURCES OF ALASKA

Hearings Held at Anchorage, Alaska, on September 7, 1960; Fairbanks, Alaska, on September 13, 1960; and Juneau, Alaska, on September 15, 1960

The essential fact about hydroelectric power in Alaska is that, although its potential generation of low-cost electricity represents one of the Nation's most valuable treasures, and the greatest power resource in the free world, less than one-quarter of 1 percent of it has been developed. More than 200 sites have been identified in Alaska as potentially productive of low-cost hydroelectric power—totaling an estimated 19 million kilowatts.

The most dramatic aspect of Alaska's hydroelectric potential is that this State provides the setting for the mightiest hydropower installation in the free world. At Rampart Canyon, on the Yukon River, a power dam could have an installed capacity of nearly 5 million kilowatts—more than 2½ times that of Grand Coulee, and greater than all the hydropower installations of TVA. Progress in techniques of transmission would make it possible to transmit this power to industrial sites and ice-free ports on the Pacific coast of Alaska to Anchorage, to Seward, to Cordova, to Valdez as well as to points even more remote from the source.

The low cost at which Rampart power could be supplied to consumers is an intriguing factor of this mighty project. The Corps of Engineers estimates that electricity would cost only 2 mills per kilowatt-hour at the site and could be supplied to users at tidewater at no more than 3 mills.

The area and capacity of the reservoir which would be created is of special interest—and as fabulous as the other facts about Rampart. An enormous manmade lake—10,000 square miles in area, and larger than Lake Erie—would be created. The storage volume would be 1,300 million acre-feet, sufficient water, if distributed evenly, to cover the land area of Alaska to a depth of 3½ feet or all of Texas to 7½ feet. Climatologists indicate that this great lake would change the climate of interior Alaska by raising the temperature. The commercial and recreational potential of this body of water is apparent.

Many challenging engineering problems are incident to the construction of Rampart Canyon Dam. The turbines and generating units required at Rampart would be larger than any now manufactured in this country. To meet problems presented by arctic temperatures the Corps of Engineers is studying techniques applied in Russia

and Scandinavian countries where similar power installations constructed under comparable climatic conditions are functioning effectively.

There is little doubt of the need for constructing Rampart Canyon Dam. Expert testimony during these hearings stressed the inevitability of power shortages in the United States which will inhibit the expansion of existing great industries, such as those using electrochemical and electrometallurgical processes or the establishment of new ones. These industries in which low-cost electricity is used as a component of the end product rather than merely as a means of providing power, will, in the near future, find difficulty in locating abundant supplies of this low-cost power. To protect and expand industrial development of the free world, this great Alaskan power resource should be developed as soon as possible.

The Rampart Dam will be a majestic monument to the wisdom of the United States, acting as a strong, free nation, to husband its natural resources for the welfare of mankind. Its very construction will be an event the world will recognize as powerful evidence that the free society of the United States remains the bulwark of Western democratic civilization.

In the words of President Franklin Delano Roosevelt in urging construction of the great Tennessee Valley Authority:

> This, in a true sense, is a return to the spirit and vision of the pioneer. If we are successful here we can march on, step by step, in a like development of other great natural territorial units within our borders.

Power requirements and resources of major Alaska cities

To study requirements of Alaska communities for electric power and resources available in the adjacent areas for supplying these needs the committee held hearings at Anchorage, Fairbanks, and Juneau. Statements were requested, in addition, from the cities of Palmer, Seward, Homer, Sitka, Haines, Douglas, Skagway, and Wrangell. At Anchorage a representative from Cordova also appeared to present its needs for additional power. Further examination of power requirements and resources of these cities and of others than those in which hearings were held was undertaken by Senator Gruening following conclusion of the formal hearings.

As a result of the hearings and the subsequent visits of the subcommittee chairman a comprehensive picture of Alaska's power needs to meet requirements of normal growth was developed. To complement the analysis of power needs, there was, in addition, a study of resources available to meet them.

The following represents the subcommittee's conclusions concerning increasing requirements for electric power in each locality visited as well as for the overall development of Alaska.

ANCHORAGE AREA

The city of Anchorage and the nearby communities of Palmer, Wasilla, Chugiak, Seward, Homer, Soldotna, and Kenai comprise the major population concentration of the State. Recent development of vast oil and natural gas reserves in the Kenai Peninsula, the existence of large military installations and Anchorage's role as the

State's major transportation hub indicate that industrial development in Alaska will be centered in this region, at least during the immediate future.

For this reason the estimates of developing power needs in the Anchorage area and of resource development to meet them is of particular importance.

Present supplies of electric power

The Greater Anchorage area is the beneficiary of the only Federal hydroelectric power project ever constructed in Alaska. The Eklutna Lake project, which was constructed under the Truman administration, with a rated capacity of 30,000 kilowatts, is the primary source of power for the city of Anchorage and the Matanuska Electric Association and provides the Chugach Electric Association with 9,000 kilowatts annually. In addition to hydroelectric power from Eklutna, the Knik Arm Power Plant of the Chugach Electric Association supplies the area with 15,140 kilowatts; the city of Anchorage maintains a supply of 6,500 kilowatts of diesel generated power; and the cities of Seward and Homer own 2,800 and 2,350 kilowatts of diesel power, respectively. When, in 1961, an additional 15,000 kilowatts will be available at the Cooper Lake hydroelectric power project under construction by the Chugach Electric Association the Anchorage area will have a supply of 71,790 kilowatts of electricity (from data supplied by the Chugach Electric Association).

Anticipated requirements for power—Anchorage area

All Federal Government agencies having an interest in the matter—the Federal Power Commission, the Corps of Engineers, the Bureau of Reclamation—as well as local authorities of the Anchorage area agree that Anchorage and surrounding communities face an imminent shortage of power.

The recent Alaska power market survey conducted by the Federal Power Commission and published in May, 1960, estimates predictable shortages of electric power in the Anchorage area before 1970. The study of the Power Commission predicts that additional capacity required in the Anchorage area by 1970 will be 51,816 kilowatts and that by 1980 this will rise to a requirement for 153,303 additional kilowatt capacity.

Testimony presented at the Anchorage hearing by the Central Alaska Power Pool, representing the city of Anchorage, the city of Seward, the Matanuska Electric Association, the Chugach Electric Association, and the Homer Electric Association pointed out that this group believes the estimates of the Federal Power Commission are "much too conservative." While the Federal Power Commission study emphasizes that its estimates were based on normal growth and increases in civilian population, without consideration being given to military demands and possible acceleration of industrialization resulting from supplies of low-cost power, the CAPP, also basing estimates on normal growth, forecasts there will be a deficit in peaking power in the area by 1964.

"Hence," in the testimony of the Central Alaska Power Pool—

> the urgent necessity to initiate and prosecute to final completion one or more projects which will provide power, on at least an interim basis, in sufficient quantities and at a price which will meet all normal utility needs and stimulate and promote industrial development and the enlightened exploitation of natural resources.

Cost of power—Anchorage area

The wholesale cost of power now available in the Anchorage area varies from 10 mills per kilowatt-hour for hydroelectric power from Eklutna to 28.5 mills per kilowatt-hour, which is the cost to the Homer Electric Association of its diesel-generated power. Within this range of rates, information supplied by the Chugach Electric Association shows that, while the costs to Chugach of Eklutna power during the months of May–November 1960 have been less than 10 mills per kilowatt-hour when the cost includes purchase of dump power, the wholesale cost of power to the co-op, including steam and diesel-generated power, has averaged between 14.9 mills and 19.2 mills per kilowatt-hour for the same period. The 1960 Anchorage city budget estimates that the average cost of wholesale power to the city in 1960 was 11.2 mills, including the cost of diesel generation.

Resources of electric power—Anchorage area

The construction of Rampart Canyon Dam would, of course, make quantities of low-cost electric power available to Anchorage on a scale which would not only meet normal demands of expected expansion of the Anchorage area economy but would, as noted above, revolutionize the industrial pattern of the State. As it is estimated that Rampart power could be delivered in the Anchorage area for about 3 mills per kilowatt-hour it is obvious that the impact of enormously expanded industrialization on Anchorage would simultaneously expand needs for electric power beyond any estimates now possible.

However, since it is not expected that Rampart power will be available, at earliest estimates, before 1970, it is apparent there must be additional installations to supply electricity to the area for needs which, clearly, will develop long before Rampart is completed.

Bradley Lake project

The Corps of Engineers has recently completed a report on the Bradley Lake project, on the Kenai Peninsula, which it believes to be the most promising site for development for the production of power to meet early shortages.

Bradley Lake is located near the bend of Kachemak Bay at an elevation of about 1,100 feet above sea level. A water diversion project here would enable construction of a powerplant having an installed capacity of 64,000 killowatts, the energy of which could be transmitted to consuming areas on the Kenai Peninsula and to Anchorage. The cost of power developed here could be substantially lessened by the availability of transmission lines constructed by the Chugach Electric Association in connection with its Cooper Lake project over which power could flow to consumers. The cost of the Bradley Lake project is estimated by the Corps of Engineers at $42 million.

(Further data concerning the Bradley Lake project are included in appendix 5B of these hearings.)

Thermal power

As indicated above, substantial quantities of power now supplied the Anchorage area are generated by diesel plants and coal-fired steam

units operated by the cities of Anchorage and Seward and by the REA co-ops. Possibilities for supplying additional power generated by gas engines to utilize natural gas supplies of the Kenai Peninsula are discussed below.

Coal

Thermal generation of power from abundant coal supplies in central Alaska as an alternative to hydroelectric power development is now the subject of careful study by the Matanuska Electric Association. Despite the relatively high cost of coal, it now appears that the lower capital costs of installation of a steam plant in comparison with the investment required for hydroelectric projects, coupled with the developing possibility of a substantial industrial customer, may make further use of this method of power generation feasible. Preliminary estimates of the Matanuska Electric Association indicate that power could be produced by a coal-fired steam plant at a fuel cost of 4.5 mills per kilowatt-hour. As compared witth the construction of hydroelectric power facilities, coal-fired steam units could be built within a relatively short period of time. Should further study show this to be economically feasible, it may prove to be a significant source of the power which will soon be needed in the Anchorage area.

Natural gas

Since conclusion of the power hearings in Alaska the attention of the subcommittee has been called to proposals for supplying the Anchorage area with electric power generated by gas engines at the nearby Kenai natural gas field. At the request of the subcommittee chairman, the following information concerning this was submitted by Mr. Robert W. Retherford, of Retherford Associates, Anchorage:

ROBERT W. RETHERFORD ASSOCIATES,
CONSULTING ENGINEERS,
Anchorage, Alaska, December 10, 1960.

Senator ERNEST GRUENING,
Chairman, Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR SENATOR GRUENING: At your suggestion, I am transmitting herewith a brief review of my beliefs regarding the use of the natural gas resources of the Kenai Peninsula for generation of electric power. These resources appear to be huge and more information is being developed almost daily which tends to confirm this. At this time no contracts for deliveries of sizable blocks of gas at wellhead are known to me, but one company of high repute has quoted a "talking price" of 16 cents per million British thermal units at wellhead. The figures which I attach to this letter are based on this price for fuel. Construction costs of generating plants are based on recent quotations by manufacturers of both gas-turbine, and gas-engine equipment, together with estimates for installation based on my own knowledge of these costs in Alaska for plants of generally similar nature.

* * * * * * *

The data attached shows that 60,000-kilowatt blocks of power generated by the Kenai natural gas resource can be delivered to Anchorage for 8 to 10 mills per kilowatt-hour and to Fairbanks for 12 to 15 mills per kilowatt-hour. These costs are definitely competitive with present costs and appear to challenge the costs of hydroelectric generation of equivalent size now being studied. Larger gas-fueled plants offer even more interesting possibilities of lowering electric energy costs in central Alaska.

It is my belief that through the use of this gas resource it will be possible to provide blocks of power as needed quickly (12 to 24 months), and for minimum investment costs. Power produced in this manner will be very competitive (in the Cook Inlet area, at least) and can certainly provide for the needs of central Alaska as they develop. To encourage the establishment of electroindustries re-

quiring the lowest cost power (2 to 4 mills), development of projects such as the Rampart will be required. In the meantime, gas can do a terrific job in meeting power needs, reducing costs and supporting the economic development of the State of Alaska.

I sincerely hope this data will be of some value to you and your committee. Should you desire additional testimony on these subjects, I shall be glad to comply insofar as my resources will permit.

Very truly yours,

ROBERT W. RETHERFORD.

SUMMARY OF PRELIMINARY DATA REGARDING ELECTRIC GENERATION FOR NATURAL GAS, KENAI PENINSULA, ALASKA

(Prepared by Robert W. Retherford, Anchorage, Alaska, November 1960)

To establish a basis for the review of electric generation possibilities utilizing the Kenai natural gas resource, it is assumed here that a project equivalent in size to the proposed Bradley Lake hydroelectric project would be a fair case to consider. This recognizes the fact that new generation is needed and power in the amounts developed at Bradley Lake could be readily absorbed. The following data is based on a 60,000-kilowatt plant operating at an average load factor of 50 percent. This plant would produce 263 million kilowatt-hours annually under these conditions. The tabulations following compare a gas-turbine plant and a gas-engine plant. A steam-turbine plant was not included because its costs are not considered competitive for this size plant in Alaska. Both gas-turbine and gas-engine plants are considered as suitable for remote operation.

Nominal plant size (installed): 60,000 kilowatts.

Annual energy delivered to bus: 263 million kilowatt-hours.

Estimated construction costs (Kenai Peninsula-wellhead):

(A) Gas turbine plant:	
4 15,000-kilowatt units, building, switchgear, substation and supervisory control, at $175 per kilowatt	$10,500,000
(B) Gas engine plant:	
24 2,500-kilowatt units, building, switchgear, substation and supervisory control, at $220 per kilowatt	13,200,000

Estimated annual operating costs:

(A) Gas turbine plant:	
Operation labor (remote and local)	$120,000
Maintenance expense, at $2 per kilowatt	120,000
Administration and other	60,000
Subtotal	300,000
Fuel costs, 263,000,000 kilowatt-hours, at 2.7 mills	710,000
Subtotal operation and maintenance and fuel	1,010,000
(B) Gas engine plant:	
Operating labor (remote and local)	120,000
Maintenance expense, at $3 per kilowatt	180,000
Administration and other	60,000
Subtotal	360,000
Fuel and lube costs, 263,000,000 kilowatt-hours, at 2 mills	526,000
Subtotal, operation and maintenance and fuel	886,000

These figures indicate costs before depreciation, interest, taxes and operating margins of—

(A) Gas turbine plan: 1,010,000/263,000,000=3.84 mills per kilowatt-hour.

(B) Gas engine plant: 886,000/263,000,000=3.36 mills per kilowatt-hour.

Depreciation, interest, operating margins and taxes will vary with the location of the plant and the source of financing. It is estimated that this could vary in the range of from 7 to 12 percent of investment costs annually. This would result in total costs at bus bar of plant of about—

(A) Gas turbine plant: 6.7 to 8.7 mills per kilowatt-hour total.

(B) Gas engine plant: 6.9 to 9.4 mills per kilowatt-hour total.

It is believed that the REA financed organizations could develop gas-generated electric power for the lower range of costs shown above.

Larger installations in the future could reduce costs of gas generation to an even lower figure.

* * * * * * *

(For further information concerning possibilities of power production by natural gas reference is made to app. 5 of these hearings.)

FAIRBANKS

The city of Fairbanks, located approximately 100 miles from the Rampart Canyon Dam site, would be affected by that construction earlier than other cities of Alaska, and to a greater degree. The construction of Rampart would, of course, not only supply the city with an abundant source of low-cost power but would speed the establishment there of a major center of industry. The construction of the dam alone would bring a large influx of workers and allied business enterprise into the area which would substantially change the character of the economy.

Present supplies of electric power

Fairbanks, a city of 20,000, and the second largest in the State, is served with electric power by the Fairbanks Municipal Utilities System and the Golden Valley Electric Association. The power is supplied by steam generation in an amount of 18 megawatt nameplate rating (testimony of Mr. Brene S. Canaday, manager, Golden Valley Electric Association, Fairbanks, September 13, 1960).

Anticipated power requirements—Fairbanks area

At the Fairbanks hearing a statement presented by Mr. Brene S. Canaday, manager of the Golden Valley Electric Association, included the following tabulation of deficiencies in power supplies which will occur in the Fairbanks area within the next 20 years, as estimated by the city and the GVEA with respect to their customers, and by the Federal Power Commission:

[In megawatts]

Year	City of Fairbanks [1]	Golden Valley [2]	Total [3]	FPC [4]
1960	9	5	14	14
1965	14	9	23	20
1970	23	16	39	28
1975	38	28	66	35
1980	61	50	111	45

[1] Based on 10-percent annual growth per FMUS estimates.
[2] Based on 12-percent annual growth per GVEA estimates (average of past 6 years).
[3] Does not include Nenana or Healy areas.
[4] From "Alaska Power Market Survey," Federal Power Commission, May 1960.

Cost of power—Fairbanks area

At Fairbanks the anomalous situation of Alaska with respect to prospective power shortages in the midst of unequaled supplies is more sharply illustrated than anywhere else. Here, 100 miles from the site of the proposed Rampart Canyon Dam where the Corps of Engineers estimates power could be delivered at the bus bar at 2 mills per kilowatt-hour, power is generated by coal-fired steamplants at a rate at the bus bar of 22.3 mills per kilowatt-hour. The average cost to

GVEA consumers is 6.4 cents per kilowatt-hour; and to customers of the municipal utility of the city it is between 5 and 6 cents.

Resources of electric power—Fairbanks area

While the construction of the Rampart Dam would take care of future power requirements of the Fairbanks area, construction of projects of lesser size to meet deficiencies before Rampart power is available is needed.

To meet this interim need the city and the REA cooperative recommend that the Corps of Engineers pursue rapidly investigations of sites on the nearby Nenana River which preliminary studies have shown to represent potential sources of electricity.

Accordingly, in response to a request from Senator Bartlett and Senator Gruening, the Senate Public Works Committee has authorized the Corps of Engineers to survey the Nenana River with a view to determining the feasibility of hydroelectric power generation.

Testimony of the Corps of Engineers presented at the Fairbanks hearing indicates the Nenana site on the Nenana River, at which could be constructed a dam with an installed capacity of 24,00 kilowatts offers the best possibility for the construction of a facility for production of the hydroelectric power now required, and required in the near future by the city of Fairbanks.

JUNEAU

The citizens of Juneau, capital city of Alaska, and of neighboring Douglas, depend for their supply of an essential public utility—electricity—upon a jerry-built system of power production and distribution which involves reliance for the principal source of power upon that generated by a defunct gold mine, the Alaska-Juneau, and distribution by a privately owned company, the Alaska Electric Light & Power Co., which is currently operating without a franchise or other formal agreement with the city. It supplies power also in the area to a rural electrification cooperative, the Glacier Highway Electric Association.

The area served, generally referred to as to the Gastineau Channel area, has a population of approximately 10,000, which is supplied by installed capacity of 7,200 kilowatts of hydroelectric power generated by the Alaska-Juneau Gold Mining Co. in addition to a 1,600-kilowatt run of the river hydroplant and a 2,500-kilowatt diesel plant which are owned by the Alaska Electric Light & Power Co. (report of the Bureau of Reclamation, "Crater-Long Lakes Division of the Snettisham," p. 2 of transmittal).

Power requirements

At Juneau, as at other cities of Alaska and its adjacent areas evidence is substantial that there will be expanding demands for electricity occasioned by an increase in population and developing industry.

The Federal Power Commission ("Alaska Power Market Survey," table 10, p. 82) estimates present power requirements of the area at 29,710,000 kilowatt-hours annually, a figure which is conservative in comparison with the statement of the Bureau of Reclamation (report on the Crater-Long Lakes division of the Snettisham project) that power requirements in 1958 were 30,347,000 kilowatt-hours. The Power Commission estimates of future normal growth demands, without

considering possible industrial development, and which may be regarded as conservative, are that, in 1970 the area will require an annual supply of 59,790,000 kilowatt-hours and in 1980 this requirement will rise to 94,590,000 kilowatt-hours.

Thus, at Juneau, as elsewhere, there is a need for facilities to produce a larger supply of power to meet developing growth.

While the need to satisfy demands for electric power arising from normal growth of Juneau is of great importance, the development of power to enable the State and the Nation to utilize the abundant natural resources of the area is essential. The timber and mineral resources of the region offer a magnificent opportunity for industrial development which could accelerate growth of the southeastern Alaska economy in a manner similar to that which could be accomplished by development of the hydroelectric potential of the Yukon in the western part of the State.

The key to development of the Juneau and southeastern Alaska resources is the availability of low-cost electricity. Here, as elsewhere in the State, there is no lack of sites from which this power can be produced abundantly.

The realization by private industry of the potential for development in the greater Juneau area is exemplified by the interest of two private groups having access to timber, in one case, and to iron ore resources on the Snettisham Peninsula, on the other.

The Georgia Pacific Alaska Co. is the holder of a preliminary award by the U.S. Forest Service of 7,500 million feet of timber in the Tongass National Forest, for which it must qualify for final award by July 1, 1961. Georgia Pacific Alaska Co. has had under serious consideration the utilization of this timber for the manufacture of newsprint. The company sent a statement to the hearing of the subcommittee at Juneau in which it said that—

> the most important single factor which has caused Georgia-Pacific-Alaska Co. to defer final action with respect to the Juneau newsprint pulp mill enterprise has been the unavailability of lower cost power.

The company estimates that the industry it proposes to establish would require the availability of installed capacity of electric power of 30,000 kilowatts, supplying 230 million kilowatt-hours annually at a cost of 6 mills per kilowatt-hour.

Another potential industrial user of the electric power which could be generated in the Juneau area is the Owen Ore Co. of Duluth, Minn., which has studied the possibilities of extracting high-grade iron ore pellets, pig iron or high iron substitutes from iron deposits at the Snettisham Peninsula in the vicinity of Juneau.

Again, in this case, a deterrent to development has been the lack of large supplies of low-cost electric power which would serve an industrial user. The Owen Ore Co. states that for the production of 3 million tons annually of high-grade pellets, there would be a requirement for power facilities of 40,000 kilowatts installed capacity. To refine the product by a process using electrical smelting equipment would require the availability of an installed capacity of approximately 200,000 kilowatts.

Hydroelectric power resources—Juneau area

The Bureau of Reclamation has recently completed a favorable report recommending construction of the Crater-Long Lakes division of the Snettisham project near Juneau which would supply the area

with quantities of electric power needed for proposed industrialization. Concurrence in the favorable recommendation has been obtained from the Bureau of the Budget.

The project recommended would provide for tapping the waters of Crater Lake and of Long Lake to be conveyed to a powerplant having an installed capacity of 48,000 kilowatts near the mouth of the Speel River, 28 miles southeast of Juneau. The plant would produce 292 million kilowatt-hours annually at a cost for firm energy of 6.1 mills per kilowatt-hour. The cost of the project is estimated at $40,090,000, which would be fully repaid, at 2½ percent interest, within 50 years.

While other potential hydroelectric power sites in the Juneau area have been studied by the Bureau of Reclamation and the Corps of Engineers, the Snettisham project, it is agreed, represents the most feasible undertaking. Reports having been completed on the project, it needs only authorization from Congress and sufficient appropriations to make it a reality.

DEVIL CANYON-SUSITNA RIVER PROJECT OF THE BUREAU OF RECLAMATION

At the hearings at Anchorage and at Fairbanks there was testimony from the Commissioner of Reclamation, Mr. Floyd E. Dominy, concerning the proposals of the Bureau of Reclamation for construction of a hydroelectric power dam at the Devil Canyon site, roughly midway between Fairbanks and Anchorage. The feasibility report on the project has not been completed; however, it is estimated the powerplant which would be constructed would have an ultimate installed capacity of 580,000 kilowatts, which would be transmitted throughout the rail-belt area. The cost of the project is estimated at about $500 million; it would require 9 years for completion after authorization; and power produced would be available at a cost of about 7 mills per kilowatt-hour. A major disadvantage of the proposed project is the lack of a reservoir area which would be required for impoundment of over 1 million acre-feet of water.

While the Devil Canyon site might provide a usable source of hydroelectric power for the benefit of the rail-belt area, its construction is not recommended in view of the far greater possibilities apparent with the construction of the Rampart Canyon Dam.

Since the Rampart site would provide power for the same relative area as the Devil Canyon site, the two must be considered together. A comparison indicates that while Rampart would cost more than twice as much as Devil Canyon, it would have an installed capacity 10 times greater than Devil Canyon and its power would be available at a cost of 2 mills per kilowatt-hour at the bus bar, and 3 mills at tidewater, in comparison with the 7 mills estimated as the cost of Devil Canyon power.

It is apparent that Devil Canyon, in comparison with the Rampart Dam, would be no bargain to the taxpayers of the United States.

RECOMMENDATIONS OF THE SUBCOMMITTEE

1. It is the first recommendation of the subcommittee that progress on construction of Rampart Dam be intensified and that action be taken as rapidly as possible to make the Rampart hydroelectric power available.

As the first step in this it is necessary that maximum funds be appropriated to the Corps of Engineers to enable early completion of investigations and studies now underway. The corps estimates that economic feasibility studies, preliminary engineering investigation and fish and wildlife studies of the area will require the expenditure of approximately $1 million. For this purpose, there was appropriated, for the 1960 fiscal year, the sum of $48,750, and for the 1961 fiscal year $225,000, or a total of $273,750 during the last 2 fiscal years.

It is urged that the remaining amount of money—approximately $726,250—be appropriated for the 1962 fiscal year in order that the necessary studies for Rampart can be completed speedily.

2. The Crater-Long Lakes division of the Snettisham project recommended by the Bureau of Reclamation should be authorized promptly by Congress. Delay in this would retard industrial progress of Alaska inexcusably. Regardless of whether industrial organizations which are now on record as having an interest in development of the Juneau area are able to carry out their proposed plans, the abundant resources of the region make it certain that the availability of low-cost hydroelectric power in large quantities will bring needed industrial development.

3. In the Anchorage area the Bradley Lake project of the Corps of Engineers offers the most promising hope for a supply of low-cost hydroelectric power. Whether or not emphasis should be given to construction of this project as an interim supply of power pending development of Rampart should depend upon studies of the feasibility of producing power from natural gas for the Anchorage area.

However, even if electric power produced by natural gas power generation becomes a reality for Anchorage and vicinity, there may well be an accumulating demand for even greater supplies of power than can now be foreseen from the natural gas source. Therefore, the possibility of eventual construction of the Bradley Lake project should be always kept in mind. In the event this proves to be a better source of low-cost power for the area than the natural gas power proposed, or in the event that, even with natural gas, another resource of power must be developed, Bradley Lake should be authorized promptly by Congress.

4. At Fairbanks the studies of the Corps of Engineers of potential hydroelectric sites on the Nenana River should be funded with adequate appropriations for the 1962 fiscal year. As is the case at Anchorage, the growing need for additional low-cost electricity to meet normal growth should be met by development of resources in the area during the period work on the Rampart project is progressing. Should it be determined by the corps that one of the Nenana sites should be developed for the production of hydroelectric power, this should be done as soon as possible.

STATEMENTS OF SENATOR JOHN F. KENNEDY ON DEVELOPMENT OF ALASKA HYDROELECTRIC POWER

Statements of Senator John F. Kennedy on the development of hydroelectric power resources of Alaska indicate that his administration will support action to make plans for the needed projects a reality.

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The following are pertinent excerpts from recent statements by Senator Kennedy on the importance of development of Alaska resources:

Let us look at this record—a record which the next administration must reverse. * * *

* * * * * * *

With the exception of one previously planned project—the Colorado River storage project—there has not been one single multipurpose, basinwide project by the United States in the past 8 years—projects which might transform the Columbia or Connecticut River Basins, or the Rampart Canyon area in Alaska. We must return to the concept of Teddy Roosevelt who realized that "a river was a unit from its source to the sea," and that only by planning for all the needs of an entire basin could we effectively conserve and develop the potentialities of our great rivers.

* * * * * * *

This refusal to develop our natural resources—to provide the "material base" for tomorrow's America—has been justified in the name of economy. But the harsh fact of the matter is that these resource policies have been the most wasteful, extravagant, spendthrift programs since the great giveaways which followed the Civil War. We have recklessly dissipated the resources on which our strength depends. We have thrown away—heedless of our growing needs—opportunity after opportunity to insure that future generations of America will have the water, the power, the timber and the fertile land on which their prosperity will depend. We have failed to invest in America's future—and a future America will have to pay the high cost of our failures.

We must, of course, rebuild the resource programs which are the proud heritage of Teddy Roosevelt and Franklin Roosevelt, and which have been neglected and ignored—forestry programs, power programs, reclamation programs, river-basin development, and all the rest. In this way we can begin to repair the damage which has already been done and start to restore our resources.

* * * * * * *

We must also move rapidly to ensure the proper development of the new American Continent—the State of Alaska. Franklin Roosevelt said that "I, for one, do not believe that the era of the pioneer is at an end; I only believe that the area for pioneering has changed." And today, America's area for pioneering can be found in the vast, northern stretches of Alaska—an unexploited area of more than half a million square miles, greater in extent than the 21 smallest States combined—a territory with a coastline longer than the combined Atlantic, Pacific, and gulf coastlines of the continental United States—and a territory rich, almost beyond belief, in the natural resources on which American greatness has been built.

Alaska's national forests alone cover a greater area than my home State of Massachusetts—huge virgin forests of hemlock and spruce and pine stretch over vast expanses of Alaskan land. The earth is rich with a great variety of minerals—and its rivers can produce enough power to supply the needs of 30 million people. This unparalleled abundance is the natural storehouse of America's future resource needs. And, thus, our growing strength and our continued prosperity depend upon the proper development of Alaska.

Yet, despite America's need for this untapped wealth, we have failed to provide the vision and the leadership essential to the huge task of developing and protecting Alaska's resources. Alaska can produce 50 billion annual kilowatt-hours of power—yet less than 1 percent of that amount has been developed. Alaska has great forests—yet they are being allowed to deteriorate for lack of access roads and proper forest management and adequate transportation.

* * * * * * *

We must meet the challenge of Alaska—the challenge to reap its abundance, build its strength, and provide a reservoir of natural wealth for a growing America. We must, of course, press forward with bold, and vitally needed projects such as the Rampart Canyon Dam. (*Speech by Senator John F. Kennedy, Democrat, of Massachusetts, on the floor of the Senate June 24, 1960. on the need to develop natural resources in Alaska and the rest of the West.*)

* * * * * * *

This Nation—in terms of its history, its geography and its vitality—could never afford to stand still. But that is more true today than ever before. For if we continue to stand still, the Russians are going to run over us. Mr. Khrushchev is going to "bury" us. He seeks not only the power to destroy us. He also seeks, by economic and political means, to isolate us—to outproduce us—to outlast us.

Take, for example, the issue of hydroelectric power. Our policy has been one of timidity. We have neglected our greatest sites. We have wasted our most valuable resources. We have substituted for a positive program an empty policy labeled "no new starts."

But the Soviets realize that power is the key to the future—to the development of industry—to the dispersal of armaments—to the race for power and prestige in every field of endeavor. On the Angara River north of Mongolia, they are building a hydroelectric project with a power output larger than the combined total of Grand Coulee and Boulder Dams. Their one project will be greater than the two greatest projects in the history of this country. And they are doing more. The tragic fact of the matter is that if Alaska still belonged to the Russians, Rampart Canyon Dam would be underway today. (*Address delivered by Senator John F. Kennedy at the Alaska State Fair, Palmer, Alaska, on Saturday, September 3, 1960.*)

But I see another Alaska—the Alaska of the future. I see a land of over 1 million people. I see a giant electric grid stretching from Juneau to Anchorage and beyond. I see the greatest dam in the free world at Rampart Canyon, producing twice the power of TVA to light homes and mills and cities and farms all over Alaska. (*Remarks by Senator John F. Kennedy at the Edgewater Hotel, Anchorage, Alaska, on Saturday, September 3, 1960.*)

HYDROELECTRIC REQUIREMENTS AND RESOURCES OF ALASKA

WEDNESDAY, SEPTEMBER 7, 1960

U.S. SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION OF THE
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Anchorage, Alaska.

The hearing convened at 9 a.m., Wednesday, September 7, 1960, in superior courtroom B, Federal Building, Anchorage, Alaska, Senator Ernest Gruening, acting chairman of the subcommittee, presiding.

Also present: Goodrich W. Lineweaver, professional staff member, Committee on Interior and Insular Affairs; and Antoinette Friedman, special assistant.

OPENING STATEMENT OF SENATOR ERNEST GRUENING

Senator GRUENING. We're on the record. I'd like to suggest that these very attractive jurors' chairs are available and there's no reason why everybody should sit at the remote end of this room unless they desire to do so, so if anyone wants to sit here these chairs are certainly available and perhaps it would make the meeting a little more informal if we are closer together.

Now that we have 12 good men and true in the jury box we ought to be able to proceed in proper fashion.

It seems to the committee that it is time for Congress to give careful and comprehensive attention to the development of Alaska's magnificent low-cost hydroelectric power resources.

Less than one-quarter of 1 percent of the 49th State's unmatched power resources have been developed. The Eklutna project, authorized by the Truman administration, which supplies power for the greater Anchorage area, is the only Federal hydroelectric power project ever authorized for Alaska. Considering our State's exceptional natural resources, it is indeed depressing that it has taken so many years to undertake the kind of study by the Senate of the United States which we commence today.

The purpose of these hearings, to be held at Anchorage, Fairbanks, Juneau, and wherever else may be necessary, follows:

1. To develop a comprehensive picture of the requirements of each of these and adjacent areas for low-cost power. This will include an examination both of present needs which are not being met, or not likely to be met in the near future, and a study of the potential requirements which may be expected to develop.

2. To provide information concerning the existence of local sources for the supply of power. This will include not only hydroelectric power, but other kinds of power generation.

3. To determine what Federal legislation is needed for maximum development of Alaska's power resources and to develop a practical legislative power program. In this connection we shall, of course, consider the role of other units of government at the community and State levels.

In carrying out this study, two major aspects of Alaska power requirements are to be considered, that is, the nature of normal consumer demand at present and in the foreseeable future, and the possibilities for far greater demands than are now apparent which would come with greatly advanced industrial development.

Today we are concerned with the power needs and resources of the Greater Anchorage area, the Matanuska Valley, and the Kenai Peninsula, as well as other nearby communities.

The recent study of the Federal Power Commission of the Alaska power market, estimates that Alaska power requirements for the whole State will jump from the present figure of 383,230,000 to 837,938,000 kilowatt-hours, or more than double the present supply in 1970 and a startling 1,487,385,000 kilowatt-hours in 1980. For the Anchorage area, it is estimated by the Federal Power Commission that demands will increase from 215,492,000 kilowatt-hours this year to 507,730,000 in 1970, and 950,840,000 or nearly a billion in 1980. Yet these figures may be conservative. We know there are abundant resources in Alaska to supply these increasing potential needs. We know that wise development of natural sites for hydroelectric power development could meet our needs. We must plan for the use of power available at more than 200 sites in Alaska and which could supply about 19 million kilowatts of energy to insure the optimum economic development of the State.

I am happy to note that the city of Anchorage, the neighboring community of Seward, the Homer Electric Association, the Chugach Electric Association, and the Matanuska Electric Association have joined in presenting a unified plan for the development of a power pool for this area. This represents wise and progressive planning of which all those concerned may be proud.

As a part of this planning, I hope we shall be able to take into account the possible construction of the proposed hydroelectric power installation at Rampart Canyon, which would provide the Western World with possibly its greatest single source of hydroelectric energy. It is not too daring to dream of this magnificent project as a reality. When this is so the city of Anchorage may expect to share in the low-cost power to be generated at this mighty dam, as it will be carried by transmission lines which could light up the cities of Alaska from Fairbanks to the Kenai Peninsula and extend westward to Nome and to Alaska farther south. In addition to providing normal consumer requirements for electrical energy at many locations, Rampart can power an industrial complex in Alaska unmatched elsewhere in the Western World.

Before proceeding with the hearing, I would inform you that, as a part of this study, there will be inspection of a number of sites for potential hydroelectric power development. These will include, in the Anchorage and adjacent areas, Bradley Lake, Cooper Lake, Devil's Canyon, and Chakachamna Lake. At Fairbanks, we shall inspect the Rampart Canyon site, and at Juneau, we shall look at the proposed Snettisham project of the Bureau of Reclamation. We shall be glad to hear recommendations concerning other sites.

I welcome your cooperation in this study, and I hope it will prove to be of benefit to the State of Alaska.

We want to conduct these hearings quite informally. If at any time any person present feels inclined to speak up, ask questions, or to have something clarified, we'd be very glad to hear from them. We ask only that they give their name and affiliation so that the record may be clear on that point. We are very grateful for the use of this courtroom to Judge Fitzgerald and to the administrative officer of the Alaska court system, Mr. David L. Luce, and we are very happy to have this new system of recording which establishes a precedent for Senate hearings and which we have no doubt will prove very effective.

Now, first on the list is the joint statement on behalf of the Anchorage Area Power Pool which represents the joint views of the city of Anchorage and the two adjacent REA cooperatives, the Matanuska and the Chugach. Now, who is going to present that statement? If you'll take that seat there, I think that mike is all set to record what you have to say.

STATEMENT OF WILLIAM J. MORAN, ATTORNEY, CENTRAL ALASKA POWER POOL

Mr. MORAN. Mr. Chairman, my name is William J. Moran. I'm an attorney here in Anchorage. I represent, as an attorney, Chugach Electric Association, Inc., Anchorage and I am here today in addition to represent the recently organized Central Alaska Power Pool. This power pool consists of, as you will note in the statement, the municipally owned electric utilities at Anchorage and Seward and the REA-financed electric cooperatives at Homer, at Anchorage, and at Palmer. In addition, and while I did not come here today in that capacity, I am chairman of the public affairs committee and legislative counsel to the Alaska Rural Electric Cooperative Asscian, which is an organization made up of the REA-financed electric cooperatives throughout Alaska. I have provided Mrs. Friedman with a number of copies of the resolutions which were adopted by that organization at its annual meeting here in Anchorage last August. (See app. No. 2.) I'm sure that Mrs. Friedman will see that the interested parties receive copies of those. Of course, a great number of people here today will be on our normal mailing list for such copies in the very near future. I proceed now with the statement of the Central Alaska Power Pool.

The Central Alaska Power Pool, which will hereafter in this statement be called CAPP, wishes to thank Senator Gruening for his very kind invitation to appear before this subcommittee in order to present a statement and to be heard further, as the subcommittee may wish, on the subject of Alaska's power needs and resources.

CAPP consists of the city of Anchorage and city of Seward in the interest of their municipal power and light departments, Matanuska Electric Association, Inc., Palmer; Homer Electric Association, Inc., Homer; and Chugach Electric Association, Inc., of Anchorage, cooperatives which participate in the REA program. Advisory members are the U.S. Army and U.S. Air Force, which operate major steam generation plants at Fort Richardson and Elemendorf Air Force Base, respectively; the U.S. Army Corps of Engineers and Bureau of Reclamation, the agencies primarily charged with the implementation of Federal generation programs; and the Rural Elec-

trification Administration. The subject of these hearings is of paramount interest to CAPP and its constituent members, as will be readily apparent from its stated objectives, which are:

1. To achieve the lowest possible cost of power to its members, consistent with their respective contractual and legal obligations and limitations.
2. To stimulate economic development through abundant low-cost power to serve and promote industrial, commercial, and domestic loads and to meet the needs of national defense.
3. To promote maximum effective use of existing power sources.
4. To provide and promote maximum economy in the selection and development of future power sources.
5. To increase the reserve capacity available to each member through appropriate and equitable arrangements with the Departments of the Army and Air Force.
6. To obtain greater flexibility in the utilization of the Eklutna project through joint purchase or interchange of power.

Except as to details having limited local application, the purposes of CAPP and the objectives of this subcommittee in Alaska are probably identical.

Those Members of the Senate familiar with the history of power development in Alaska will note with approval, as Senator Gruening has, that the above-named municipally and cooperatively owned electric utilities have associated together in the belief that this cooperative effort, long overdue, will result in the more rapid realization of their common objectives. These several utilities serve much of south-central Alaska, including the Matanuska Valley, Alaska's richest agricultural area and the site of extensive coal mining; the city of Anchorage and surrounding areas as far south as Portage, Alaska's principal population center; and the Kenai Peninsula, which includes Alaska's largest port and promising seafood resources (Seward), Alaska's major oil and gas fields, which are already in substantial production, and numerous communities and sites having largely undeveloped seafood, timber, agricultural, and mineral resources.

The potential hydroelectric sites in Alaska have been identified by the U.S. Army Engineers and the installed capacity of each site has been preliminarily estimated. Senator Gruening has already made reference to the "Alaska Power Market Survey" of the Federal Power Commission, which was issued as of May 1960. In that particular publication is a list of these hydroelectric sites. Of the numerous sites, only a very few have been studied in any detail. Of these latter, there are three of immediate interest to CAPP. They are: Rampart Canyon on the Yukon River, Devil Canyon on the Susitna River, and Bradley Lake on the Kenai Peninsula, near Kachemak Bay.

The potential benefits of the Rampart project to Alaska can hardly be calculated. If low-cost power in abundance is the key to the development of Alaska, a point which is unchallenged, the full utilization of Rampart's power would have a profound effect on all Alaska. Unfortunately, its immensity is both a blessing and a handicap: a boon in that it could furnish so very much power at such low cost; a detriment in that its study, design, and construction, even on an incremental basis, will require many years—and time is precious.

That is not to say, of course, that the Rampart project should not receive the very highest priority, or that its study, design, and con-

struction should not proceed without delay and with all reasonable haste. Those of us who were privileged to hear Senator Gruening, Senator Moss, and others report on their personal inspection and reconnaisance of Soviet power resources and developments pursuant to Senate Resolution 248 of the 85th Congress, 2d session, or who have read the report and staff studies of that inspection, dated January 4, 1960, will readily appreciate that the effective utilization of our power resource is more than a matter of Alaska's development. It is a matter of national interest, perhaps even of survival. Senator Gruening expressed it aptly and well when he noted that, had Russia not surrendered sovereignty over Alaska, the Rampart project would be "on the line," or well along toward completion. I might state parenthetically, Senator Gruening, that I was happy to note that Senator Kennedy has also adopted that position. I suspect that he has had good instruction.

All power requirement studies, whether by the Federal Power Commission, Rural Electrification Administration, the several electric utilities, consulting engineers, or others, point up the urgent necessity of providing additional generation if CAPP members are only to keep pace with the increased demands of normal growth. Reference was made above to the "Alaska Power Market Survey" of the Federal Power Commission, which purports to project Alaska's power requirements over a substantial period. Although the publication is dated May 1960, the data cited therein is often 2 years or more out of date, a fact which naturally mitigates the reliability of its forecasts. As reference to that publication has been made earlier, I do believe that is something that should be brought particularly to the committee's attention. This isn't a matter of blaming anybody for the fact, but a most casual review of that publication by members of the organization I represent reflected a great deal of data which is quite out of date and consequently is not too reliable for that reason.

Senator GRUENING. I think we're aware of the fact that there are a number of changes that could properly be made in that report.

Mr. MORAN. The members of CAPP also believe the FPC forecast much too conservative. A graphic representation of the estimates that each CAPP member has made of its power requirements is attached hereto. These forecasts reflect anticipated normal growth based upon past experience. That is, no allowance has been made for the effect of extensive power-use promotion or major industrial and commercial developments. Projections, particularly for Seward and the Homer Electric Association, Inc., are based upon their respective experiences with very high-cost diesel generation. No utility has incorporated into its projection the effect of the availability of truly low-cost power. Considering that these forecasts are based upon a fairly static or status quo operation, and allowing for the fact that none of these utilities have the benefit of low-cost power, nevertheless, it is expected that the area will have a deficit in peaking power during 1964. Hence, the urgent necessity is to initiate and prosecute to final completion one or more projects which will provide power, on at least an interim basis, in sufficient quantities and at a price which will meet all normal utility needs and stimulate and promote industrial development and the enlightened exploitation of natural resources.

The Devil Canyon and Bradley Lake projects appear to offer great possibilities as interim projects—projects which will get the job done

pending the completion of Rampart and will thereafter continue to supply valuable power to a large area. The words "appear to offer greater possibilities" are used advisedly, for the fact is that CAPP has insufficient information to justify a final recommendation. It has been reported that definite project reports have been completed on both and that these reports are now under review at administrative levels higher than the Alaska district offices of the Bureau of Reclamation for Devil Canyon and U.S. Army Engineers for Bradley Lake. Were these two projects to proceed under relatively optimum conditions, which undoubtedly includes congressional appropriations for design and other preliminaries early in the 1st session of the 87th Congress, it has been estimated that their power would be "on the line" within 5 years. If either of these projects is to answer the interim power requirements of this area of Alaska, no delay should be permitted in the initiation of design and construction.

The reported installed capacity at Devil Canyon would be upward of 580,000 kilowatts, as contrasted to 64,000 kilowatts at Bradley Lake. There would be, of course, a difference in construction costs and, probably, in the cost of power. The Devil Canyon project includes a high-voltage transmission line to serve both Fairbanks and Anchorage, an important consideration in view of the urgent need for an effective power grid throughout the Rail Belt, as has been recognized and recommended by the Technical Inter-Agency Power Group, composed of representatives of the Departments of Defense, Commerce, and Interior, Office of Defense Mobilization, and Federal Power Commission. I make reference here to their report of June 29, 1959, to the Director of the Office of Civil Defense Mobilization. (See app. No. 1.)

Bradley Lake power could be wheeled to Anchorage over the transmission line which Chugach Electric Association, Inc., is presently constructing in connection with its Cooper Lake project, a possibility which should substantially reduce the cost of its power. These are some of the considerations which are mentioned when the relative merits of these two projects are discussed. Perhaps their greatest attraction, and in this respect the information available puts them on a par, is that definite project reports have been prepared for both and design could proceed immediately after authorization and the appropriation of funds.

No one seriously interested in the development of Alaska can ignore thermal generation. Alaska has large deposits of coal, oil, and natural gas. Their use in electric generation would provide a substantial market for these products and thereby encourage exploration and development. It is not necessary to detail here the advantages and disadvantages of thermal generation as compared with hydroelectric generation, because the subcommittee has access to the latest technical information. CAPP urges the subcommittee to take advantage of such information and to be sure that full consideration is given to all methods of generation, including the use of nuclear reactors. Notwithstanding the necessity of studying all methods of generation, CAPP hopes that Congress and the several executive departments concerned will keep very much in mind the desperate need for action and that valuable time will not be lost in extended

studies or in the development of new approaches to the discharge of the Federal function in the field of public power.

The Alaska Rural Electric Cooperative Association, of which Matanuska Electric Association, Homer Electric Association, and Chugach Electric Association are members, sponsored the enactment of legislation in 1960 under which the State of Alaska will play a more active role in the development of Alaska's power resources. Chapter 135, Session Laws of Alaska 1960. (See app. No. 13.) The League of Alaskan Cities, in which Anchorage and Seward hold memberships, supported that legislation. The nature and extent of the role that Alaska will play in such development will be determined by further study and legislative action. CAPP believes that the initiation of Federal action on major generation projects should not await the completion of such studies or the taking of such action, although it expects the State of Alaska to contribute substantially to the development of a sound power program in Alaska.

The subcommittee will receive more detailed information from other witnesses on the importance of power to Alaska's growth. CAPP wishes to stress in its presentation here today the very urgent need for immediate action in order that interim projects can be built while Rampart is in the study and design phases. If the ordinary electric utility needs of its consumers are to be met, substantial additional generation must be available to CAPP not later than 1964; if electric power is to be available in the quantities and at a cost which will attract industrial activity, only a major project should be undertaken.

Notwithstanding its tremendous resources, Alaska does not now have low cost power, regardless of the method of generation. The availability of such power is an esential condition to a prosperous Alaska serving the national interest. This statement is respectfully submitted to you, Senator, and to members of your committee by the city of Anchorage, the city of Seward, the Matanuska Electric Association, the Homer Electric Association, and the Chugach Electric Association.

Senator GRUENING. Thank you very much, Mr. Moran. I want to congratulate you and the component agencies on a very comprehensive and excellent statement which forms a very good base for the beginning of this investigation.

We have present with us also a representative of the city of Cordova, Mr. Boddington. And while Cordova is not included in this group, we are no less solicitous of its needs, as well as the needs of any community. If Mr. Boddington is ready to make a statement we would be very happy to hear him.

STATEMENT OF R. A. BODDINGTON, REPRESENTING CORDOVA, ALASKA

Mr. BODDINGTON. I am R. A. Boddington and I represent the town of Cordova, Alaska.

The town of Cordova in 1955 employed an engineering firm from Seattle to make a study of power. At that time they made an extensive study of what they could get from Power Creek, but the cost was too high. They have made several studies of different places since but the cost was always too high. They didn't have the resources or

the money in the town to support the bonded indebtedness. Now, at the present time the offal of the crabs is going down the chute because the cost of power is too high to use to process it. The heads and tails of the fish are going down the chute the same way because of the cost of power. The quicker they can get those fish in the cans and shut the cannery down at 4 cents a kilowatt now the better they like to do it.

Now, what I came here for was, I believe, to have Power Creek given consideration for a small hydroelectric plant for Cordova. They have other small resources but I don't think that they would be economically feasible, for once we get low cost power—Cordova has a potential of growing. There's lots of timber, there's a good harbor and the lake behind Cordova will give it a wonderful supply of water for a pulp mill or anything that we can get in there.

Senator GRUENING. Mr. Boddington, what's the source of power now in the city of Cordova?

Mr. BODDINGTON. Diesel power.

Senator GRUENING. It's diesel power?

Mr. BODDINGTON. Yes, sir.

Senator GRUENING. And how much do you pay for your oil?

Mr. BODDINGTON. We pay 17.7 plus a cent and a half for hauling.

Senator GRUENING. Can you give us any idea what the rates are, the initial rates and so on?

Mr. BODDINGTON. Yes, sir. Well, at the present time our residential rate for the first 50 is 10, the next 50 is 8, and all over that is 4. For a small business, the first 500 is 10, the next 500 is 8, the next 500 is 7, the next 500 is 6, and all over is 4.

Senator GRUENING. Have you knowledge of an available hydro site?

Mr. BODDINGTON. Power Creek, could be a very good powersite. It has a potential there of between 1,000 and 1,500 kilowatts which is enough to supply Cordova for quite a number of years.

Senator GRUENING. Have any studies been made of this site?

Mr. BODDINGTON. A study was made by Howard Harstad in 1955.

Senator GRUENING. It's not been made by either the Corps of Engineers or——

Mr. BODDINGTON. The Corps of Engineers have had a water gage in Power Creek since somewhere in the 1940's and it's still there. They take a reading once a month.

Senator GRUENING. Mr. Boddington, we'd be very happy to receive from you a fuller statement which we'll put in the record when it's received. We're going to keep the record open for several weeks and any further details that may be pertinent, we'd be glad to have. The total amount of consumption, the community's ideas as to the potential consumption, how much goes to industry, how much goes to home use and so forth.

Mr. BODDINGTON. I would have had it for the record but I didn't know I was coming here until after 1 o'clock yesterday.

Senator GRUENING. Well, we'd be very glad to keep the record open and to include it when we receive it. Thank you very much.

Mr. BODDINGTON. I thank you.

Senator GRUENING. The next witness will be the Commissioner of Reclamation, Mr. Floyd E. Dominy, who has come to Alaska for this purpose. Mr. Dominy, we are very happy to have you here and

we appreciate your traveling to the 49th State for the purpose of testifying. Mr. Dominy, I'm glad to say, will accompany us to our other hearings and so that he will have a very comprehensive view of the situation and be able to make a substantial contribution in all these various localities.

STATEMENT OF FLOYD E. DOMINY, COMMISSIONER OF RECLAMATION

Mr. DOMINY. Senator Gruening, it's a real pleasure to be here in Alaska again for my second visit. I was here just a year ago for the first time to your wonderful State. I want to tell the committee that I have Mr. Daryl Roberts here with me this morning. Mr. Roberts had been in Alaska working on project investigation matters since the Bureau of Reclamation was first authorized by Congress to come in here in 1948. He now heads up the Bureau of Reclamation's Alaska office and if the committee wishes to get into any detailed discussion of the work underway by the Bureau, Mr. Roberts will of course be happy to assist it.

I appreciate the opportunity to present to this committee the Bureau of Reclamation's program for hydroelectric power and other water resource development projects in the State of Alaska. The opportunity to accompany the committee on its inspection of the various potential sites is also greatly appreciated.

Before going into discussions of the Bureau program, I would like to outline some of the difficulties encountered in developing a comprehensive water resources plan for this vast State. Under present conditions, Alaska is largely undeveloped. Its population is centered in a few cities, each of which is remote physically and topographically from the others. Differences in the economy of the various sections of the State accentuate the physical separation.

Today we are meeting in the most populous section of the State and in the area which is expected to grow more rapidly than the rest of the State. The Alaska Railroad and Glenn Highway tie Anchorage to the inland areas and to the enormous natural resources waiting development throughout the State.

In the past the sparsity of population, topographic problems, and lack of commercial or industrial development has caused the generation of electric power to be developed largely on a basis of meeting needs as they occur, by emergency measures. The power requirements have not been large enough to warrant the construction of large central powerplants. Accordingly, the cost of power to consumers has been high and the use of electricity for all purposes has been limited.

Agencies of the Department of the Interior have been active in investigating, planning, and constructing projects and programs for the development of Alaska's resources practically from the date of its acquisition as a territory. Its outstanding potentialities for waterpower development in connection with the exploitation of the minerals, forests, and other resources were recognized and formed the basis for the programs of the various agencies.

The Congress provided funds in the Interior Department Appropriation Act for fiscal year 1948, specifically for the Bureau of Recla-

mation to investigate and report on water resources projects in Alaska. Similar appropriations have been made in each subsequent year, aggregating now $2,215,000 through fiscal year 1960 for investigations and over $30 million for construction of the Eklutna project. With these investigation funds, we have prepared a comprehensive reconnaissance report covering the known potentials throughout Alaska We have also a report on one complete river basin and we have completed 10 individual reconnaissance hydroelectric project reports.

Construction of the Eklutna project was authorized by the act of July 31, 1950, and was started in fiscal year 1951. Since 1955 this project has been supplying power to the cities of Anchorage and Palmer and outlying districts to supplement existing power sources.

The principal features of the Eklutna project include rehabilitation of an existing dam at the lake outlet, drilling a pressure tunnel 23,800 feet long, 9 feet in diameter to tap Eklutna Lake, erection of a powerplant and penstocks including two 15,000-kilowatt generators, and construction of 41 miles of 115-kilovolt transmission lines to Anchorage and Palmer. This one plant doubled the total installed hydroelectric power capacity in the entire State.

The growth of the power market in recent years has been very rapid. Local interests have attempted to keep pace with the requirements by the construction or installation of small powerplants to meet their immediate needs. It was recognized, however, by all concerned that a more comprehensive approach and a more forward-looking solution to the overall problem is essential. This realization led to the study by the Bureau of Reclamation of larger individual units which could not only serve all existing needs but, through the availability of large blocks of power at lower generating cost than the existing sources, would encourage and promote the greater amounts of power through industrial development and population expansion.

We have recognized that the Rail Belt area, consisting of all the communities on the Alaska Railroad from Fairbanks to Seward, was most in need of such a power development. Our first step, therefore, was to make a study of the Susitna River Basin, which is in the heart of that area. Many promising potential hydroelectric powersites were identified through that study. The upper reaches of the Susitna River are especially favorable to power development as there are no right-of-way problems, the stream is not used for navigation, and the waters do not support a valuable fishery due to the turbidity caused by glacial silt. From these standpoints, the Susitna River is much better suited to power development than any of Alaska's other major streams.

It appears that the Devil Canyon site on the Susitna River, roughly midway between Fairbanks and Anchorage, offers the best opportunity for a major power development. Detailed studies of the Devil Canyon project were undertaken by the Bureau of Reclamation and pushed to completion as rapidly as our limited investigation funds permitted. The feasibility report on the Devil Canyon project is now essentially complete, and we expect very soon to be in a position to recommend its construction.

The project would consist of two major dams and reservoirs and a powerplant with an ultimate installed capacity of 580,000 kilowatts. At the Devil Canyon site, a concrete arch dam is proposed, rising over 600 feet from its foundations. This would impound a reservoir

of over 1 million acre-feet. Major regulatory storage will be provided at the Denali Dam and Reservoir site 115 river miles upstream from Devil Canyon Dam site, where an earthfill dam with a height of 219 feet above the riverbed would form a reservoir of over 5 million acre-feet. Devil Canyon powerplant at the base of Devil Canyon Dam would have eight generating units of 72,500-kilowatt capacity each, for a total of 580,000 kilowatts. Transmission lines from this powerplant would extend north and south the length of the Rail Belt area to deliver Devil Canyon project power wherever the need develops and to intertie existing power sources for more efficient operation and economy.

Devil Canyon project, in our opinion, lends itself logically to stage development as the power needs of the area grow. Initial installation of 217,500 kilowatts is contemplated with three generating units. Subsequently in successive stages Denali would be built and the additional units would be added to the Devil Canyon powerplant as the market situation dictates.

The hydroelectric capacity of the Devil Canyon project should meet the requirements of the Rail Belt area for many years. The plan lends itself to further expansion should major power-using industries be established, as there are a number of very attractive additional sites which can be developed and tied into the Devil Canyon transmission network. Between Denali and Devil Canyon Dams, the Susitna River flows through a canyon which offers a number of potential powersites. Although they are yet to be investigated in detail, we have identified two sites which would use much of the available head through that reach of the river; these are Vee Canyon and Watana sites. Another very attractive possibility is the Chakachamna site located directly across the Cook Inlet from Anchorage where a large lake has been formed by glacial action. A comparatively short tunnel tapping that lake could lead the water to a powerplant near sea level. Further in the future is the outstanding possibility of a high dam at Wood Canyon on the Copper River. These future possibilities could provide over 2 million killowatts of installed capacity, which would furnish the power for a tremendous industrial, commercial, and domestic economy for the Rail Belt area.

Through all of this program of investigation and development by the Bureau of Reclamation of proposed power projects, we have not lost sight of the tremendous power potential of the Rampart site on the Yukon River. This is probably the largest single power potential on the North American Continent. It constitutes an invaluable resource for the future and opportunity to support an industrial empire in Alaska. Its potential is so large and it is so valuable a resource that it must neither be overlooked in the long-range planning nor developed to less than its ultimate capacity. Recognizing the disparity between the foreseeable requirements for power in the immediate future and the capability of the Rampart site, we believe construction of feasible projects of lesser magnitude which more nearly conform with the power market pattern required to provide for the growing demand should first be undertaken.

Senator GRUENING. Thank you very much, Mr. Dominy. There are one or two questions that I'd like to ask you in line with your concluding sentence that feasible projects of lesser magnitude should

first be undertaken. It's clear that these larger projects will not be completed very rapidly and we want to concentrate not merely on the long-range needs but on the immediate needs. Now how long would it take for Devils Canyon to be completed, assuming that it were authorized say, by the 87th Congress?

Mr. DOMINY. If the project were authorized in the next session of Congress and the construction funds made available, say in the 2d session of the 87th Congress, the construction period would take how long, Mr. Roberts?

Mr. ROBERTS. We estimate the power to be on the line by around 1969.

Senator GRUENING. Then it's about 9 years?

Mr. ROBERTS. Well, it would take about that. It could be accelerated a little, but by the time we get the money and all of that it would probably be about 1969.

Senator GRUENING. The "all that" is quite a period of time when you're dealing with Congress, we've discovered very frequently.

Mr. ROBERTS. We recognize that. Actually, if we could get both authorization and construction funds in the next session of Congress that period could be shortened.

Senator GRUENING. What would be the cost per kilowatt-hour at the bus bar?

Mr. DOMINY. We don't have a final figure on that yet, Senator. The Denver office where we do our final design and engineering is working on its estimates at the moment and I cannot give you a figure and would not want to put in the record a figure now because we haven't finalized those costs.

Senator GRUENING. You couldn't give us an approximate tentative estimate?

Mr. DOMINY. Well, I'm satisfied that it will run somewhere between 6½ and 7½ mills, delivered to the cities along the rail belt.

Senator GRUENING. That would be a good deal higher than the estimated cost of kilowatt-hours from Rampart, would it not?

Mr. DOMINY. I understand that preliminary estimates on Rampart under full utilization would get it down to around 4 or 4½ mills, but full utilization of over 4 billion kilowatt-hours of power is hardly immediately foreseeable.

Senator GRUENING. What hydro projects, Commissioner, would you consider available for this area that could be completed—assuming funds and authorization were available in less time? We could hardly afford to wait 9 years for an increased supply of power in this region.

Mr. DOMINY. We believe that this Chakachamna site offers very good opportunities. We, of course, won't know until perhaps next year exactly what the potential of Chakachamna is. I had occasion to fly over it and look at it quite closely a year ago. It's the type of project that could be constructed much more rapidly of course and would supply a substantial block of power I think much quicker that the Devils Canyon site and accordingly may offer a real opportunity for early development.

Senator GRUENING. Have the studies of Chakachamna been sufficient so that you could give us any idea as to costs and the length of time before construction were completed, assuming funds were available?

Mr. DOMINY. No, we're actively engaged in that, in the preliminary work this season. We have the gaging station in. We've had a group up on the lake measuring depth of the lake to get some idea of the quantity of water available. This project would merely involve a tunnel and powerplant, the dam is already in place by nature, and that tunnel work, of course, could be driven on a year-round basis, which is a great advantage in the short construction season in Alaska. All I can say is I think it has real capabilities but we won't have details until our studies are more advanced.

Senator GRUENING. Don't we need a project that can be completed within 3 or 4 years and will tide us over until such time as the larger projects further north come into being?

Mr. DOMINY. Yes, I think that's very definitely true and, unless that can be provided by some hydro projects that can develop quite quickly, why, of course, there will have to be additional thermal plants developed to tide the area over.

Senator GRUENING. Are you familiar with the potentials of Bradley Lake which is being studied by the corps?

Mr. DOMINY. Not in detail, no. Mr. Roberts has advised me and I think this offers one of the early opportunities for development.

Senator GRUENING. Do you believe that thermal plants may be necessary to tide us over in the intervening period or do you think we can rely on hydro?

Mr. DOMINY. Well, as I understand, there may be need for additional power here in this area as early as 1964, possibly sooner. If that need develops, it would certainly crowd any construction schedule that I visualize to get additional power by hydro projects.

Mr. GRUENING. Thank you very much, Mr. Dominy. I think that temporarily we'd like to pass on to the next witness but we certainly want to hear further from you and Mr. Roberts—when we get into the details.

Mr. DOMINY. Very good, sir.

Senator GRUENING. Next we'd like to hear from the Corps of Engineers. We are, very happy to note that Gen. A. F. Clark, the North Pacific division engineer of the Corps of Engineers, U.S. Army, is here. I don't know whether you shall testify, General Clark, or whether district engineer Colonel Hanburger is prepared to speak.

General CLARK. No, I'll leave it to Colonel Hanburger.

Senator GRUENING. Well, you leave it in very competent hands we know. Colonel, will you proceed?

STATEMENT OF COL. CHRISTIAN HANBURGER

Colonel HANBURGER. Senator Gruening, members of the committee, and gentlemen. I am the district engineer, Col. Christian Hanburger.

The Corps of Engineers, by directives of the Congress, has been instructed to prepare a review of Interim Report No. 2, "Cook Inlet and Tributaries." This review report covers all phases of the original survey report which was completed in January of 1950, and in addition includes information on new projects and problems which had been brought to our attention since 1950. The review report is being completed in two stages, the first stage of which is entitled "Hydroelectric Power, Bradley Lake Project," and includes a review of the

hydroelectric potential of the area draining into Cook Inlet. The report is now under review by the North Pacific division office of the Chief of Engineers in Portland and by the Office of the Chief of Engineers in Washington, D.C. I must make it quite explicit at this time that the information presented here on this report must be considered of a preliminary nature and is subject to change during review by our higher echelons.

In coordination with the preparation of our report, the Federal Power Commission was requested to include in its power market survey on Alaska, then under preparation, particular reference to the Anchorage and Cook Inlet area. The San Francisco regional office of the Federal Power Commission completed its report in May of 1960. Their report tabulated existing power installations and those scheduled to be producing power between now and 1980. The report further tabulated the estimated future power requirements to the year 1980. These figures show that by 1965 a power shortage of about 20,000 kilowatt capacity will develop in the Cook Inlet area. By 1970, the shortage is estimated to be 52,000 kilowatts; by 1975, about 102,000 kilowatts; and by 1980, the shortage is estimated to become about 153,000. These figures include the Cooper Lake project, which is now nearing completion. Senator, you can plainly see from these figures that a definite and extreme power shortage is going to develop in the Cook Inlet area if provisions are not started now to alleviate this forthcoming shortage.

In its review of the power picture in the Cook Inlet area, the Alaska district has considered the various means of eliminating this shortage. From the standpoint of cost, there is no question that hydroelectric-generated power will be the least expensive and is readily available. To dwell for a moment on the subject of power cost, the Federal Power Commission estimates the cost of thermal power in the Anchorage area to be $34.77 per kilowatt-year for net dependable capacity and 7.87 mills per kilowatt-hour for incremental energy. The corresponding figures at Homer for thermal power generation are estimated to be $39 per kilowatt-year and 15.73 mills per kilowatt-hour. The cost of power from Bradley Lake, which has a benefit-to-cost ratio of 2 to 1, would be one-half of the cost of thermal power.

Many sites lying within or near the Cook Inlet area were considered before choosing Bradley Lake as being the best project for development within the short time it will take a power shortage to develop. It is believed that other sites considered have merit as future hydroelectric developments and that a time will come when they will fit well into the plan of development. Examples of these would be the Snow River project with a prime capacity of 36,000 kilowatts and the Nellie Juan project with a potential prime of about 63,000 kilowatts.

Let us now look briefly at just what is involved in the Bradley Lake project. I have here displayed a brief map of the Bradley Lake area. In the upper right-hand corner it shows its location at the foot of the peninsula and as I go through this discussion I think you'll be able to follow it somewhat on the chart. Bradley Lake is located near the head of Kachemak Bay at an elevation of about 1,100 feet above sea level. The project would control approximately 70 square miles of drainage area, about 30 percent of which is covered by glaciers. A

rock-fill dam about 125 feet in height and 460 feet long at the crest would raise the lake to an elevation of about 1,200 feet above sea level. Two very small dams would divert the flow of two small glacial streams into Bradley Lake. Though based upon limited runoff data, a conservative estimate of the regulated flow would be 415 cubic feet per second. A concrete-lined power tunnel, which you can see in green, 11 feet in diameter and about 2½ miles in length would lead to a surge tank located at the head of an 8-foot steel penstock. The penstock would convey the water down the hillside to a powerhouse located near the edge of Kachemak Bay. The powerhouse would contain three generators capable of producing a total of 64,000 kilowatts. Power would be transmitted to the using areas on the Kenai Peninsula and to Anchorage. The total estimated cost of the Bradley Lake project is in the neighborhood of $42 million. The benefit-to-cost ratio, as previously stated, is estimated to be 2 to 1.

Several problems of an engineering nature may be expected in connection with the construction of this project. First of all, a great deal of care may have to be taken while excavating and lining the power tunnel. From preliminary geological investigations, it is believed that several faults lie across the path of the tunnel which may complicate the task of construction. These could lead to unstable rock conditions and to inflow of water during construction. Construction materials other than the rock for the rock-fill sections will have to be brought in. This might include aggregate for the concrete portions of the dam. Access to the diversion locations will likewise probably be difficult and will require innovation in construction methods in order to keep costs to a minimum. Each of these problems will, of course, be solved during the planning and design stage of development. It is considered fortunate in the case of Bradley Lake that the fish and wildlife problems will probably be insignificant.

The final important factor involved is the time required for authorization, design, and construction. Once the project is authorized, with timely furnishing of adequate funds, it is estimated this project could be producing power in 4 years. From this you can see that if the coming power shortage is to be met with adequate generating capacity, it is imperative that action be taken very soon to add additional capacity from the least expensive source.

I shall now be pleased to answer, with the aid of my staff, any questions which you may have on this subject.

Senator GRUENING. Thank you very much, Colonel Hanburger, for your very clear and pertinent statement. Let me ask you this: How much more study in standpoint of funds and time will be required so that you can bring this project to a point where we could ask Congress for an authorization?

Colonel HANBURGER. Mr. Moats, can you answer?

STATEMENT OF HAROLD MOATS, CORPS OF ENGINEERS

Mr. MOATS. I am Harold Moats of the Alaska district of the Corps of Engineers. The report which we have under review in the Office of the Chief of Engineers now is approximately in final form for presentation to Congress for authorization. Assuming that the report

clears the Office of Chief of Engineers within the next few weeks, and I believe that will be the case, the report can be ready for presentation to Congress when they reconvene in January or very shortly thereafter.

Senator GRUENING. Well, that's very gratifying. Can you tell us, Mr. Moats, about how much has been expended to date on the investigations?

Mr. MOATS. We will have to look at that in two ways. As some of you may recall, at the request of former Governor Heintzleman, the corps made a brief study of Bradley Lake as a possibility of producing power for an ammonium nitrate plant. This was back in 1954. I'm going to have to make a rough estimate of the cost of that portion of the investigation. I would say we expended somewhere in the neighborhood of $15,000 at that time, then in the preparation of the report which I have just mentioned, the one that is in the hands of the Chief of Engineers right now, we fully utilized the information that we had previously gathered and we have spent somewhere in the neighborhood of $30,000 of additional funds in preparing this report. So I would say that the total funds that we have spent on Bradley Lake, approximate $45,000 to $50,000.

Senator GRUENING. Will you require any further appropriation for investigation?

Mr. MOATS. Not further than the funds which are in it this year. We would be ready to start our advance engineering and design as soon as the Congress has authorized and appropriated funds.

Senator GRUENING. Can you give any approximate idea of the kilowatt-hour cost of the bus bar for Bradley Lake?

Mr. MOATS. Our preliminary estimates indicate that it will be in the neighborhood of about 6 to 6.1 mills.

Senator GRUENING. Does your estimate of approximately $42 million include the cost of any highway construction to the site?

Mr. MOATS. A small access highway from Bear Cove is all it includes.

Senator GRUENING. Will further highway construction be necessary?

Mr. MOATS. It would be very desirable that the highway be extended from the end of the road which now runs some 12 to 14 miles toward the project from Homer and there are remaining somewhere in the neighborhood of 25 additional miles of highway crossing the Fox River Delta which would be extremely helpful. It would not be absolutely necessary but it would facilitate the construction phase of the program very much.

Senator GRUENING. Well, we'd be glad to ask highway authorities to program this additional road which I'm sure the people of Homer will welcome in any event.

Mr. MOATS. Thank you.

Senator GRUENING. We'll come back to that but it would seem on the evidence to date that the project that is most nearly ready and that would supply the needs of the area for the next few years is the Bradley Lake project. We will next hear from Mr. Robert Retherford, power consultant, who has devoted a great deal of time and interest to these projects. Mr. Retherford will you come forward and give your name and identification.

STATEMENT OF ROBERT W. RETHERFORD, CONSULTING ENGINEER, ANCHORAGE, ALASKA

Mr. RETHERFORD. I am Robert W. Retherford, a consulting engineer, headquarters in Anchorage.

I've been associated with electrical distribution and transmission projects since about 1937 and since 1950 largely in Alaska with electrical systems involving distribution, transmission, and generation by diesel, hydro, and steam. I am presently engineering consultant for several projects throughout Alaska, covering the communities of Anchorage, Fairbanks, Homer, Kodiak, Kotzebue, Naknek, Dillingham, Seward, and have also done additional work at Palmer, Glenallen, Auke Bay, Nome, Cordova, Seldovia, Nenana, and Northway.

This experience covers the problems of private, municipal, and cooperative electric systems. My work with all these systems has been generally aimed at solving the need for more and lower cost electric power. Many communities of Alaska are physically isolated from other communities by considerable space of roadless, relatively uninhabited wilderness. This creates a considerable obstacle in the path toward adequate, low-cost, electric-power supply. Individual electric plants of small size serve most of these communities at relatively high cost. The possibilities of interconnection by transmission lines to areas of lower cost energy seem remote, yet there appear to be some interesting possibilities in theory—although little practice by which to judge more accurately. Some of these possibilities include that of single-wire, long-span, low-cost transmission lines of high-voltage direct current or single-phase alternating current with conversion to more useful three-phase alternating current power at the load centers. Other arrangements more complex and for higher power levels have been studied and experimented with in other parts of the world, Sweden, Russia, England, in a very minor way in the United States, and they are learning more of this all the time.

I feel that it would be well worth while to study some of these possibilities as related to the problem of long-distance transmission of relatively small amounts of power as transmission of power goes in the typical utility market. Alaska has great distances and small electric loads at the present time. This, of course, makes this problem a real challenge to engineering. Low-cost electric energy in these small, widespread communities, will probably depend in large measure on solving this transmission problem.

The larger communities in the Cook-Inlet rail belt area including Homer, Seward, Anchorage, Palmer, and Fairbanks have better power supply at somewhat lower cost but still relatively high by most standards. Load growth is gaining rapidly on generating capacity, as has already been pointed out here very effectively, and new sources of power must be developed.

Transmission lines are under construction to interconnect the Palmer, Anchorage, Seward, and Homer areas. A minimum-size transmission line to Fairbanks along the Alaska Railroad route would provide power supply and interconnection at points along the way and could deliver sufficient power to Fairbanks to provide some improvement in power costs, I believe, but primarily would serve to "expose" more area to central station service and provide a circuit for connec-

tion of additional small hydro or mine-mouth thermal generating plants along the way. The availability of such a transmission feeder would stimulate the growth of existing electric loads and open up to new consideration projects along the way now hampered by lack of power. This feeder-type transmission line could later take a place as a subtransmission circuit when larger high-voltage, high-capacity lines are built to take power from projects such as the Rampart.

I believe that careful investigation would show that a line of 115,000 volts along the 350 mile route between Anchorage and Fairbanks, although posing some real technical problems, could transmit about 20,000 kilowatts satisfactorily and would encourage development of additional small, lowcost hydro projects along the way that are now handicapped by isolation primarily. Perhaps even mine-mouth plants in some of the coalfields along the way would, of course, increase the total amount of power available through this small transmission line and help meet load growth.

Load growth of the Kenai-Anchorage-Fairbanks area requires new starts of generation immediately. This has been well pointed out here already. The Matanuska Electric Association, the city of Anchorage, and the city of Seward I believe are possibily in the greatest need at the moment and will really need additional power within a year. Some temporary surplus power can be made available to them from the Chugach-Homer hydro-steam-diesel combination, which will be in operation by that time. This power is however, somewhat high cost and is limited. Completion of the transmission system associated with the Chugach-Homer Cooper Lake project will provide a way through which additional generation by hydro or thermal plants could be added quickly to help take care of these needs that are developing. It is to be hoped that the proposed Bradley Lake project will be found to offer low-cost power supply and that if so, development may begin very soon.

The basic "domestic" market for electric power in Alaska can be satisfied by developing carefully selected generating projects of thermal or hydro character and matching them closely to developing needs. Real industrial use of electric power for processing or manufacturing of wood products can come to Alaska only through development of large blocks of low-cost power which must be competitive on a world-wide scale. This requires a very careful look at all projects of considerable size to be certain that economic factors affecting the competitive position of prospective industries is properly evaluated.

In summary, I would say, that Alaskan electric systems need—

1. A new approach to transmission of small amounts of power over long distances.
2. Continuing development of smaller blocks of relatively low-cost power to match "domestic" load growth.
3. Development of major hydro projects of very low-cost power for encouragement of industrial expansion for competition on world markets.

Thank you.

Senator GRUENING. Thank you very much Mr. Retherford. Mr. Retherford, from your general knowledge of the situation and the needs here, what projects do you think we should concentrate on for the immediate future?

Mr. RETHERFORD. Well, from what I know of the projects that have been seriously under study, it appears that the Bradley Lake hydro project offers the most interesting possibilities from the standpoint of hydro. I think it is possible that thermal generation should be looked at perhaps more carefully along with it, but the Bradley Lake project has had a great deal of study and, on the basis of Colonel Hanburger's and Mr. Moats' statement, it sounded like that they are pretty well ready to go. I'm certain that every consideration should be given to pushing that project.

Senator GRUENING. Do you think that if we could proceed with the Bradley Lake project, ask for an authorization and appropriation from the next Congress and secure it, development would take care of the needs of this area for 3 or 4 years until some of the larger projects could get into action?

Mr. RETHERFORD. Well, you know in Alaska the proposition of whether you've got enough power or not and how much good the project will do is a tough one to answer and it has been my observation generally up here it's like what has happened in other parts of the world. The availability of power at a cost that's better than what has preceded it means it will be used very rapidly. So I would guess that in spite of how quickly Bradley Lake might be completed it will always be that demand is developing ahead of it. I also feel that probably there will be need for some additional power betwen now and the time that Bradley Lake can be completed.

Senator GRUENING. How would you suggest that that power be supplied—before the time that Bradley Lake is completed, assuming that we can get maximum speed? I refer to authorization and appropriation in the 87th Congress. What would you suggest as an interim supply of power?

Mr. RETHERFORD. Well, about the only type of power that could be completed on a schedule more rapid than that proposed for Bradley Lake would be some type of thermal generation and there are ways of developing thermal generation based on the fuels available in the area now. It could be fairly rapid. Some types of thermal generation could be installed with a year's planning and construction.

Senator GRUENING. Are you familiar with these projects? Would you be in a position to supply us a memorandum on them?

Mr. RETHERFORD. Yes, at the present time proposals considering thermal generation are receiving a very preliminary look with consideration for some of the resource. I believe that the Matanuska Electric Association has carried on quite a study with respect to the coal resource in the Matanuska Valley and perhaps they have a representative here that could give us a little more information on that. I'd be very happy to compile some additional data and supply it to your committee.

Senator GRUENING. Well, we'd like to have that and we'd also be glad to hear from the representative of Matanuska on this project just to make certain that if necessary there isn't a lapse between the time Bradley Lake can be completed, assuming that we can get the necessary go ahead and authorization and appropriation for it. I think we ought to try and avoid, if possible, any period in which there is an actual shortage of power here, so I'd appreciate any statement that you can contribute to the record for that purpose and would also

try to get one from the Matanuska people or anyone else who is familiar with this subject. Thank you Mr. Retherford.

We'll be very glad to include any adidtional information in the record in addition to your oral statement.

The next witness will be Mr. Ivan Bloch, who is a well-known consultant, a great expert in this field, and who is very familiar with the needs of Alaska. Mr. Bloch, we'd be very happy to hear from you.

STATEMENT OF IVAN BLOCH, INDUSTRIAL CONSULTANT

Mr. BLOCH. Senator Gruening, and gentlemen. My name is Ivan Bloch. I'm an industrial consultant having specialized in heavy power-using industries during the past 20 years. I'm also a partner of North Pacific Consultants of which Mr. Retherford is another partner, which are engineers for the Cooper Lake project. From 1938 to 1947, I was chief of the Division of Industrial and Resources Development of the U.S. Bonneville Power Administrattion in the Pacific Northwest. I was also a special consultant to the Secretary of the Interior on the industrial development of the West and Alaska. In 1947, I opened private consulting practice in Portland, Oreg. and continued to serve the Department of the Interior, the Corps of Engineers, the Governor of the State of Oregon in the field of industrial development. I was also retained for the same purposes in the Philippine, Jamaica, West Indies, and Chile, South America. My private clients have included a number of industrial concerns particularly interested in heavy-power using industries. I am now a consultant to a new aluminmu industry proposing to build an aluminum reduction plant at Longview, Wash. I might say that the purpose of my paper, Senator Gruening, is to discuss my professional belief that there exists a market for certain types of electric power in Alaska which will far surpass any of the project that we are talking about including Rampart.

During the past 20 years I have assisted in the analysis and location of eight major aluminum plants, three ferro-alloy plants, two calcium carbide plants, one chlorine plant, one abrasives plant, and various others.

Before expressing my considered views regarding the urgent need to develop Alaska's power resources, I would like to define the category of industry which I believe will seek location in Alaska, and the kind of power which will be required to make the location of these industries economically feasible.

The electro-process industries are those in which electric power is a raw material ingredient as contrasted to that which is used in other industries merely to turn wheels. In this category of industry are those producing aluminum, magnesium, titanium, zirconium, hafnium, electric steel, electric pig iron, electrolytic copper, zinc and nickel, ferro alloys, chlorine and caustic soda, calcium carbide, elemental phosphorus, artificial abrasives, and many others. These are the industries whose products are virtually basic to the maintenance and progress of modern civilization, and to its defense.

The products of these industries cannot be made except by means of the electric furnace and the electrolytic cell. The amounts of electric power utilized per pound or ton of product are enormous. One ton of

aluminum requires in excess of 15,000 kilowatt-hours. One ton of elemental phosphorus consumes 13,000 kilowatt-hours and so on. Minimum-sized production plants must, therefore, be supplied with large blocks of power. For instance, a minimum sized aluminum plant for 20,000 short tons of metal per year requires on the order of 45,000 kilowatts, and will consume in excess of 300 million kilowatt-hours per year. I think you can compare those with some of the estimates that have been made for the Anchorage area.

Because of the process characteristics of these industries, power supplied must be continuous; that is, it must be firm.

At this point, therefore, I wish to stress an important ruling consideration. Power supplies for electro-process industries must be of the lowest price. In the Pacific Northwest the average price of power to the very large aluminum industry located there has been slightly under 2 mills per kilowatt-hour. It should be pointed out, however, that in the Ohio Valley, aluminum plants have been established relying on large mine-mouth, coal-fired generating plants producing power at between 4 and 5 mills per kilowatt-hour. The reason such high cost power can be used by these aluminum and other electro-process plants is that this location in the Ohio Valley, is in the midst of the major consuming markets for the end products. Stating this in other words, the economic feasibility of electro-process plants depends on a balancing of power and transportation costs. A plant in the center of markets can afford a somewhat higher price of power. A plant distant from major markets can operate economically only with lowest-price power.

With reference, therefore, to the ultimate location of major electro-process industries in Alaska, it will be necesary to consider only those hydroelectric projects which can provide large blocks of continuous power at tidewater for not more than 2 to 4 mills per kilowatt-hour. The upper range of 4 mills, in my considered judgment, however, would only be valid probably 15 to 20 years hence when whatever remaining hydro in the rest of the United States has been fully committed as to markets. I base this estimate on analyses I have made, and to which I will refer later in this statement, regarding the supplies of power which will be available in the rest of the United States for the next 20 to 40 years.

In terms of information available at this time on the characteristics of Alaska hydro resources, it is my opinion only a few projects can be considered to qualify for potential major Alaskan electroprocess industry establishment. These are, in apparent order, the Taiya project near Skagway-Haines; the Rampart project on the Yukon; Wood Canyon project on the Copper; and possibly Bradley Lake for some limited electroprocess operations. I do not rule out the potentials of other hydro which future engineering studies may reveal as feasible in terms of their ability to produce power in large blocks within the delivered price range I have indicated. Nor do I rule out the eventual large-scale utilization of coal or natural gas, provided the costs fit the pattern.

At this time, it appears to me of critical and urgent importance to define potential electro-process power markets. Obviously, the large hydroplants, outside of Bradley Lake to which I have referred, can only be built if there is reasonable likelihood that their output can be

absorbed. By the same token, however, we cannot talk about specific markets until and unless full-scale investigations of potential sites have been made.

During recent years, I have made numerous studies of the power requirements of national electroprocess industries. Within the past few months, I have completed some preliminary estimates for as far in the future as the period 1980–85, and even to the year 2000, which after all is only 40 years away. At this time, I should like to introduce for the record, the preliminary results of my studies for a few major electroprocess industries. This does not purport to be a complete list but it is indicative of what my professional analysis reveals. And if you will turn to the last page, Senator, I have listed some estimates for the year 1985 showing both national production requirements for example: aluminum, magnesium, and so forth, and the consequences are related demanding power in megawatts, and just for a moment to show that by 1985 and I think that the figure reasonably conservative, aluminum metal alone would necessitate an excess of 27 million kilowatts in the United States, and merely taking this partial list, and it is partial because there are many that it does not include, the total of those listed is in excess of 40 million kilowatts of firm power.

From this tabulation of both production and consequent power requirements for these electroprocess industries by the year 1985, the aluminum industry is by far the largest. My estimates are supported by estimates of the Aluminum Co. of America, Reynolds Metals Co., Kaiser Aluminum & Chemical Co., Ormet, which is Olin Mathieson, and Revere, and by the Ford Foundation-supported research corporation, Resources for the Future. With regard to Resources for the Future, this agency's findings with regard to copper and aluminum incidentally were made part of the record of the Select Committee on National Water Resources, U.S. Senate, 86th Congress, 2d session, in its report, "Future Water Requirements of Principal Water-Using Industries"—Committee Print No. 8, April 1960, page 79. By 1985, it is apparent that the U.S. aluminum industry will produce around 16 million tons of metal, or approximately 5 times the present U.S. production capacity. This reflects the amazing average annual rate of growth of 13 percent which has taken place during the past 20 years, but which I have considered as slackening off somewhat the future years.

Taking U.S. aluminum requirements alone, the 16 million tons of capacity by 1985 will necessitate providing around 27 million kilowatts of firm power at low cost. To what extent can Alaska provide some of these power requirements? The answer I believe will be found in the analysis of where else power supplies of the essential characteristics defined will be found. In very brief summary, I believe it is fair to state that by the 1980's we will be scraping the bottom of the national hydropower barrel with the exception possibly of the Pacific Northwest and certainly of Alaska.

Generally, the outlook for electroprocess industry power supplies as I visualize it during the next two decades or so is as follows: Some expansion will take place in the Pacific Northwest although a good deal will depend on the policies which will control the further development of the Columbia and its tributaries, including the Ca-

nadian portion of that river system. With regard to the construction of very large mine-mouth, coal-fired steam-electric plants in the Ohio Valley and adjacent areas, the basic question is whether or not sufficiently large, very low-cost coal-mining properties are available to sustain the operations of many more such large steam-electric plants. I believe that the potential expansion there is somewhat limited. The next possible area for electroprocess industry development would be that adjacent to the vast Rocky Mountain coal region based on the use of these coals in very large mine-mouth steam-electric generating plants. However, the transportation costs to market from this inland area, removed from tidewater or large navigable river systems, will place a restriction on the economic feasibility of locating large electroprocess plants there. As to nuclear power, the present outlook is very much clouded and uncertain as to whether it will take two or several decades before techniques are sufficiently advanced to provide power of such low-cost levels as to make them attractive or even economically feasible for electroprocessing.

Thus, at this juncture, using aluminum as a prime illustration, my opinion is that another 2 or 3 million kilowatts can probably be developed in the Ohio and adjacent areas, another 1 or even 2 million may become available in the Columbia River system, with the remaining 18 million kilowatts of requirements, this is just for aluminum, to be sought in Alaska and in the Rocky Mountain coal area. This only refers to aluminum and does not consider the requirements for other electroprocess industries.

It must be realized that the aluminum industry, and this is also true of other electroprocess industries, has always sought hydro areas in preference to others, and especially in underdeveloped areas in which competition for sources of power supplies are either absent or very small. Thus, we find plants as isolated as that at Kitimat in British Columbia, to which the basic raw materials are shipped by water from the Caribbean area, and the finish pig aluminum transported long distances to consuming markets. The exceptions of plants in the Gulf Coast and Ohio Valley have been forced by short-term considerations rather than by long-term preference. With regard to the very great activity of the U.S. aluminum industry in seeking foreign hydropower locations, attractive as some of the possibilities may appear physically, the ancillary political and economic turmoil taking place in such areas as the Congo obviously place a serious question mark on such potential sources in terms of U.S. demands, not to mention national security. The same conclusions are applicable to other segments of the electroprocess field.

Therefore, it is my present opinion that a major portion of electro industry expansion could and should take place in Alaska at such as Taiya, and in tidewater areas which could be fed by such as Rampart. The development of these great projects should be commenced at the very earliest possible moment, not merely because they represent a tremendously important resource for the economic development and stability of the new State, but because there is urgent national and security need for the power output. In view of the magnitude of the undertakings, the breadth of engineering investigations required, and of negotiations which will be necessary with our Canadian neighbors, time is of the essence. Thank you.

(The table referred to by Mr. Bloch is as follows:)

U.S. electroprocess industries—Some forecasts of future production and power requirements for 1985

Industry	Short tons	Power	Industry	Short tons	Power
	Thousands	*Megawatts*		*Thousands*	*Megawatts*
1. Aluminum metal	16,000	27,200	8. Ferroalloys	3,500	2,870
2. Magnesium metal	570	1,080	9. Elemental phosphorus	1,300	1,950
3. Titanium metal	150	660	10. Chlorine and caustic	16,000	580
4. Zirconium metal	130	570	11. Calcium carbide	2,300	920
5. Electrolytic copper	1,620	210	12. Fused alumina	210	129
6. Electrolytic zinc	840	395	13. Silicon carbide	430	210
7. Electric steel	38,000	3,800			

Senator GRUENING. Thank you very much, Mr. Bloch, for your very comprehensive and excellent statement. Of course, as you realize, being familiar with the history of it, the Taiya project seemed to be an immediate prospect that vanished into thin air because the Aluminum Co. of America had apparently not secured the permission of it to the Dominion authorities to proceed. Everything else seemed to be perfect but that was an important ingredient that was lacking and which will still be necessary and I doubt whether that applies to any of our other projects, although the Rampart may have some Canadian implications. Ah, on the basis of what you know of the situation and what you've heard, what would you propose as the immediate steps to take care of the needs of this greater Anchorage and Kenai Peninsula and Matanuska Valley area?

Mr. BLOCH. Well, Senator Gruening, I have to echo the statement of my partner, Mr. Robert Retherford, or we wouldn't be partners long. [Laughter.] But I believe fully that Bradley Lake offers the best hydro possibilities at this time for this area. There are some small hydro potentials such as Grant Lake and Ptarmigan Lake which certainly ought to be looked into also. Thermal generation is important provided we could get down to some really low cost of basic fuels, whatever it may be. I cannot disagree with Mr. Retherford in his statement whatsoever.

Senator GRUENING. Well, then, you would suggest that we proceed with the utmost speed with the Bradley Lake project, exploring thermal projects at the same time——

Mr. BLOCH. And some small hydro projects.

Senator GRUENING. Some small hydro projects such as those you mentioned and then go ahead full speed with some of the larger projects which would take perhaps a decade to complete. Is it your belief that, if we can get Rampart authorized, Bradley authorized and appropriated for, and Rampart sufficiently financed to proceed with the studies, that these two projects would more or less take care of the needs with a few other local projects?

Mr. BLOCH. Well, that's a somewhat difficult question to answer——

Senator GRUENING. Well, you're prepared to answer difficult questions.

Mr. BLOCH. I still of course feel, Senator, that Taiya is one that we should keep plugging at because pictures change. I believe that with the pressures being brought to bear by both the Canadian and U.S. electroprocess industries, some of these political problems be-

tween Alaska and British Columbia would vanish very quickly in thin air. I think the atmosphere is a lot better than it was at the time Taiya was first discussed and at which time both Alcoa and Reynolds looked at it. So that is certainly one project that needs to be looked at again and we have to keep pushing a little bit. Perhaps a hot poker helps. With regard to other projects, I think Bradley is certainly one that should be commenced immediately. Thermal sources should be fully investigated and I think they're of a magnitude and "financiability" that they may be easier to bring about than perhaps has been recognized. Rampart should not be delayed because it's going to take time to provide the necessary investigations and to start construction. It's a mammoth project so you can't wait on that one. Now, inbetween, I don't know. I think Devil's Canyon sounds pretty good although the power costs as discussed to date, I would say, are on the high rather than on the medium size of scale of power cost needed here. Chakachamna—I've had the occasion to discuss it with Mr. Roberts on numerous occasions—sounds like a very interesting project. But in total I would say this, that, unless Alaska is going to be different from every other part of the world, power supplies will have to be at reasonable cost. I don't mean 1½ to 2 cents per kilowatt-hour projects.

The domestic power market will develop very rapidly. I think we haven't begun to exploit the full use of power in Alaska for electric house heating, for example, even though it may seem perhaps a little farfetched. If electric house heating came to its own—and I believe it has a chance even with natural gas coming into the picture—it's going to be very hard to keep balance between demand and supply. I think the problem in Alaska has not been one so much as developing markets as it has been of providing sufficient quantities of power at reasonable costs. That's the basic problem—it's not a chicken and egg in this one. Provide the power and I think it will be consumed.

Senator GRUENING. Thank you very much for your very excellent presentation. I have a letter here from Rear Adm. Chester Kunz, retired, city manager of Seward, who says he is unable to be present but that Mr. Ray James is here prepared to testify in behalf of Seward. We would be very happy to hear you Mr. James.

STATEMENT OF RAY F. JAMES, MANAGER, SEWARD ELECTRIC SYSTEM, SEWARD, ALASKA

Mr. JAMES. I am Ray F. James, manager of the Seward Electric System, Seward, Alaska. Senator Gruening, we are one of the little towns that is a good deal like the man from Cordova said—we have high-cost power. We have a large bond issue at 6 percent interest and it's going to take something really good to help us out. At the present time, we are working under contract with Chugach Electric to get power from Cooper Lake, but even at that it's going to be very high cost to us. Unless Bradley Lake or some of the others—thermal generation or something—can come along that can reduce the wholesale cost of power to Seward, we are always going to be in this same position we are now, for the next 20 years. They're not going to be able to make their bond payments and give the people the rate in electricity that they need to even prosper. That is our problem. What the help will be or where it can come from I don't know.

Senator GRUENING. What is the source of your power now?

Mr. JAMES. Diesel generation.

Senator GRUENING. You have a municipally owned plant?

Mr. JAMES. That's right.

Senator GRUENING. As I recall it, a few years ago you had two competing companies, one privately owned and one publicly owned.

Mr. JAMES. That's right.

Senator GRUENING. And the privately owned company was sold to the municipality? Is that correct?

Mr. JAMES. That's right.

Senator GRUENING. And you do not now receive any power from any of the cooperatives?

Mr. JAMES. No, sir.

Senator GRUENING. But you hope to from Cooper Lake?

Mr. JAMES. That's right.

Senator GRUENING. Has the city of Seward entered any negotiations with the Chugach?

Mr. JAMES. Yes; we have. In fact, we have made a tentative contract subject to REA approval.

Senator GRUENING. Does that offer any prospect of lower rates?

Mr. JAMES. Very little. The savings in generation to the town will probably be about $20,000 a year, but with their bond issues as high as they are and the interest as high as it is our chance to lower the rates very much, I'd say, is exceedingly small.

Senator GRUENING. Could you supply for the record a schedule of your present rates, your bond situation, the amount of bonded indebtedness, the interest rates, and your prospective capacity to pay these—in other words, elaboration of what you are now saying orally?

Mr. JAMES. I have it all; yes.

Senator GRUENING. You have it all. We'd like very much to have it for the record.

Mr. JAMES. I can submit it. I'll see that you get it.

Senator GRUENING. How much more power do you need than is now supplied by your present capacity, your diesel plant?

Mr. JAMES. Well, you come back to this basic question that all these gentlemen are interested in. We could sell probably three times the power we do now. Our generating capacity now is about 2,400 kilowatts, but we could have considerable more than that. We have two sawmills that would like to take power, but on the price that we have to quote for power they can generate their own with diesel power cheaper. So our chances of selling power at the present time are really slim. Our normal 50-watt or 50-kilowatt-hours of electricity to a home costs 15 a kilowatt and that just barely pays off the bond issue.

Senator GRUENING. We'll grant you, that's very high. I'd like to ask someone who could answer this question, possibly Mr. Moran. If we develop this additional power, say through Bradley Lake, would that be available to communities such as Seward?

Mr. MORAN. Well, Senator, I would expect it would be. I welcome the opportunity to make this comment on the basis of what Mr. James has said. I have no quarrel with it except that I'm afraid it might be subject to misunderstanding. First of all let me say that Mr. James and the people he represents are participants in my

joint statement. We are not quarreling. We are in agreement as to what is needed. However, I would like to clarify the position of Chugach Electric Association in this. It might be misunderstood that we are profiteering from Seward's desperate need for lower cost power. As a matter of fact, the rate at which we are attempting to provide power to Seward represents a composite of all Chugach's costs of generation, which includes a rather expensive steam-generation facility here in Anchorage. We have to put all of our generation in one pot and then average out the cost. Even at the rates which Mr. James finds high (and I agree that they are; believe me Chugach's power is high, too.) Our ability to provide power to Mr. James at the figures we are quoting anticipate and contemplate an arrangement that Chugach itself is going to be serving an area around Kenai Lake directly or will be serving power to the Kenai Lake Electric Cooperative for distribution there.

This means that not only will the city of Seward be amortizing the investment in additional transmission and substation facilities but some 200 or so consumers in the Kenai Lake-Moose Pass area will also be contributing. So this is rather a complex thing. It is expensive. It's very expensive, but unfortunately power to Chugach's consumers in Anchorage and to the municipal consumers in Anchorage is also expensive.

We have no low-cost power in Alaska. Eklutna is certainly not cheap power, as I'm sure Mr. Roberts would be the first to agree. We just don't have low-cost power in Alaska. That is our problem. We have the advantage in Anchorage, of course, of a more favorable market. We have better load factors. We have better conditions under which to serve than Seward and for that reason we have a lower rate at the domestic or consumer level. But we don't have low-cost power, nor unfortunately, does Seward or anybody else. And certainly neither does Mr. Farnen down at Homer. He is depending, too, on diesel generation.

CEA will require a 78-mile 115-kilovolt transmission line from Cooper Lake to Anchorage which is one of the things I mentioned in my statement which is important when considering Bradley Lake, although Colonel Hanburger did not mention it. The transmission line to Cooper Lake is sufficiently sized at least to the Quartz Creek substation site, which is near the intersection of the Seward and the Sterling Highways near Kenai Lake that the Bradley Lake power could be brought in over an existing transmission line. Since we know how much money is involved in building that line, we believe that it would contribute to lower cost power from Bradley. I assume that Bradley Lake power would be available to Seward.

Senator GRUENING. Mr. Moran, obviously we need low cost power, much lower cost power in Alaska than we now have, but even prior to achieving that objective we need sufficient power at whatever cost available so that these communities will not run short of it. Now, I'd like to ask you this further question, following up your answer on the subject of Seward. If Bradley Lake is developed in the near future as we hope it will be, will that take care of all the immediate needs of the various areas here? In other words, you have included Seward. Assuming it will take care of the Matanuska Valley, would it take care of the needs of Anchorage and the entire Kenai Penin-

sula? Does that include all the communities on the Kenai Peninsula such as Kenai and Ninilchik and Soldatna and so forth?

Mr. MORAN. I don't question for a moment, Senator, that the power from Bradley as described by Colonel Hanburger would be adequate to meet the power needs of the area which you have described, so long as we're thinking in terms of meeting a normal growth situation. What bothers me, and I hope I stressed this sufficiently in my statement, is the fact that we are constantly thinking only in terms of meeting this normal growth. We are not thinking strongly enough of the importance of making power available for industrial development. We can already identify a certain amount of activity. Mr. Farnen from Homer has listed a number of projects on the Kenai Peninsula which would require far more power than Mr. Farnen is able to supply, and probably more power than Mr. Farnen will have out of the Cooper Lake project in which Homer is participating. So we are always thinking of getting the lights on in our residences, getting the streets lighted, and handling our normal commercial activities, but we are not thinking enough about these very large blocks of low-cost power to which Mr. Bloch referred.

So I can say that Bradley Lake will take care of our loads as we have projected them, but only within the context of that projection. We are not talking about industrial development. We are talking about hanging on and meeting our basic needs.

Senator GRUENING. Well, I think that's correct. I simply wanted to make clear for the record that in this stopgap arrangement which I think is the best you can call it although sorely needed, the development of what seems to be the most immediate project, namely Bradley Lake, that there will be plans for taking care at least of the immediate and temporary needs of this entire area. Now, I wish you would explain what the process is by which other communities in the Kenai Peninsula can be included in the service of either the Chugach or some other REA cooperative. Do they have to make special application for that?

Mr. MORAN. Well, in the first place, Senator, you are aware that any financing we are able to obtain through the REA must be within the limitations of the Rural Electrification Act of 1936, as subsequently amended. That act is designed to central station electric service to rural America. By definition in the act itself, a rural community is one which has less than 1,500 population. In order to provide service to areas which by definition are rural, REA recognizes that it may be necessary to develop generation facilities. If we have a power surplus to what is immediately required, on the basis of certain advantages which may accrue to the rural program, it is sometimes possible to make power available to non-rural areas. It is under such an arrangement that Chugach is making power available to Seward. As Mr. James knows, one of the conditions is that Seward's diesel powerplant be constantly maintained in standby in order to contribute to any need which may develop on the Chugach system for the power which that plant can provide.

We are presently the holders of a preliminary permit on the two lakes to which Mr. Bloch made reference. (When I say we, I mean Chugach Electric.) They are Ptarmigan and Grant Lakes.

We have discovered, Senator, and I think this is not an original discovery, that major construction projects pose a heavy administrative burden. Chugach is the construction agency for the Cooper Lake project, an investment of approximately $14 million. Homer, in addition, is building a 69-kilovolt line to Kasilof to tie into its system. Chugach is building the transmission line to Anchorage, which is included in my 14 million estimate.

Chugach is the largest utility in Alaska in the number of consumers served. Anchorage may be selling more kilowatts because of the commercial, concentrated load in the city of Anchorage, but Chugach is serving the greatest number of consumers by far of any utility in Alaska. Chugach has more consumers than all other cooperatives in Alaska combined. I want to bring Chugach's size in relation to these other utilities. Chugach has a tremendous administrative load to carry in building a project the size of Cooper Lake, without talking about a major project.

Cooper Lake, as you know, will have an initial installed capacity of 15,000 kilowatts. It is by any standard a small project, but I do not personally believe that Chugach, the largest cooperative and the largest utility in Alaska, could reasonably be expected to be the sponsoring agency for a truly large electric generation project.

I believe that the development of Alaska requires public power. For all the advertisements that we see in the newspapers and magazines, America's independent electric utilities are not prepared to meet Alaska's power needs. They have shown no interest to do so and I don't anticipate that they will. This is a public power area and must be developed as a public power area. I believe that the real answer to Alaska's power needs were found in the activities of two of our Federal agencies represented here today. Perhaps I should say three of them: the Federal Power Commission, the Corps of Engineers, and the Bureau of Reclamation. We cannot expect to undertake with REA funds the kinds of projects we need in Alaska to have truly low-cost power for development purposes.

Senator GRUENING. Well, you'd include REA as one of the public agencies that was concerned even though they perhaps haven't the potentials for development that the Corps of Engineers has and the Bureau of Reclamation have.

Mr. MORAN. I certainly do, sir. Of course, I may be considered biased on the subject, but I think that REA has done a terrific job in Alaska. I think that REA has a great deal of work still to do here.

Senator GRUENING. I would agree with that.

Mr. MORAN. However, I want to stress that I have no reason to believe REA is going to have available for loans in Alaska the kind of money required to build projects such as Bradley Lake and others. But in the field of distribution and transmission, particularly distribution, REA has a very great part to play here and I believe it will play it.

Senator GRUENING. What studies have been made of Ptarmigan Lake and Grant Lake?

Mr. MORAN. Ptarmigan and Grant?

Senator GRUENING. Yes.

Mr. MORAN. I will defer, if I may, Senator, to either Mr. Retherford or Mr. Haner, both of North Pacific Consultants, who have been

consulting engineers on any work that has been done on those two projects at the request of Chugach Electric Association.

Senator GRUENING. Well, I think we would like for the record, some statement as to their capacity, cost, and any other details that would be pertinent to this record.

Mr. MORAN. I believe either Mr. Retherford or Mr. Haner of North Pacific Consultants much better qualified to answer your question than I am, Senator.

Senator GRUENING. Mr. Retherford, would you be able to supply that for the record?

Mr. RETHERFORD. I think Mr. Haner would be the man to give us the information and I'm sure he would be glad to supply it.

Senator GRUENING. Mr. Haner, would you please come forward and testify on that subject?

STATEMENT OF NORMAN W. HANER, PROJECT ENGINEER, NORTH PACIFIC CONSULTANTS

Mr. HANER. My name is Norman W. Haner. At the present time I am project engineer for North Pacific Consultants on the Cooper Lake project. I prepared the preliminary studies on the Grant Lake-Ptarmigan combination for the purpose of preparing an application for a preliminary permit filed with the Federal Power Commission. This permit was granted to the Chugach Electric Association, Inc., and from that study which was a map study with reconnaisance by air and on the ground indicated that there could be about 6,000 kilowatts of firm power developed from the combined projects, being located approximately 15 miles from the Cooper Lake project system, including Taiya, and supplement the power from Cooper Lake to take care of the immediate needs. The cost of that project indicated that it could be put on the line for 6 or 7 mills per kilowatt-hour at the bus bar. It would not cover the cost of the transmission and it would have to bear its portion of the cost of transmission. It is a relatively simple construction project which could be accomplished in a period of 3 or 4 years. The plant has excellent capability of storing for peaking capacity which the combined systems of the area could very nicely use. I believe that's about all I can say now. The field survey work required to make a definite project plan has not been started and would take approximately one season.

Senator GRUENING. What would be the total cost?

Mr. HANER. I think I'd better hold that and give you a restatement on that later, sir. I can't remember the exact figure.

Senator GRUENING. Well, I think the committee would appreciate it if you would supplement your excellent oral statement with any further details that will cover the subject of these additional projects that you have in mind and that Chugach is interested in.

Mr. HANER. Very well.

Senator GRUENING. Thank you very much. Mr. Moran, I'd like to ask you this further question. Assuming the development of the Bradley Lake project, how would that power be allocated between the various interested communities and agencies? What would be its relation to Chugach, Matanuska, city of Anchorage, and any others who might be needing the power?

Mr. MORAN. Well, Senator, unfortunately, I am not too familiar with the way projects of that kind are handled by the Corps of Engineers assuming that it is a Corps of Engineers project. I believe that there would be a formula under which its power would be allocated on the basis of need. I know that in the case of the Eklutna project the allocation was related to the actual or relative needs of the utilities which in effect underwrote the project. I'm referring to the city of Anchorage, to Chugach, and to the Matanuska Electric Association. Colonel Hanburger or Mr. Moats would be more qualified than I to testify to that.

Senator GRUENING. Well, I'd like very much to have that brought out for the record. General Clark, can you tell us?

STATEMENT OF GEN. ALLEN F. CLARK, NORTH PACIFIC DIVISION ENGINEER

General CLARK. I'm General Clark from the North Pacific division, Corps of Engineers. I do not know of a case where the Corps of Engineers distributes power it generates. We generate a great deal of power as a part of our various developments but the marketing is generally handled by the Department of the Interior and I think I should pass the question to the Department of Interior. [Laughter.] We have the Bonneville Power Administration, for instance, in the Columbia in northwest Oregon, and so on, which handles the distribution of power generated by the corps. I do not believe we are in the transmission or distribution business.

FURTHER STATEMENT OF COMMISSIONER DOMINY

Mr. DOMINY. That is correct, Senator. The Department of Interior has been the bargaining agent for federally produced power. Assuming that would be the case here we would, of course, look to the preference customers and their immediate needs. Obviously, if the immediate needs were greater than the power available, there would have to be a discussion and allocation process pursued. To the extent that the preference customers' immediate demands could be met by the power produced we would conclude contracts to the full capacity of the project to meet those needs.

Senator GRUENING. Well, in this situation, would all be preference customers?

Mr. DOMINY. I think in this area the powerloads we're talking about are all in the preference category.

Senator GRUENING. There is no such thing as a preferred preference customer then, is there? [Laughter.]

Mr. DOMINY. Well, that's a very difficult one to answer. We customarily, of course, assume the position in sale of power that we, the Federal Government, are not a utility with utility responsibilities. The Congress has never seen fit in any part of the United States to place the Government in that position, nor do I expect they would do so in Alaska, so it's really a job of meeting immediate demands to the extent that we can with all the customers looking somewhere else for their additional needs. It's not a simple process where the demand is greater than the supply. We have figures, of course, that Mr. Daryl

Roberts has worked up that indicate the load growth pattern in the projection of utility markets. The need for peak demand in 1960 is about 61,000 kilowatts, in 1965 a peak demand of 99,000 kilowatts is forecast, and in 1970 a peak demand of 164,000 kilowatts is expected. So even with Bradley Lake on the line as quickly as it would be possible to develop it, you still wouldn't be meeting these growing needs as we see it even without the kind of industrial expansion that power consultants have brought into the record here today.

Senator GRUENING. It seems to me that that is a very correct appraisal of the situation. What we must try to develop out of these hearings as a basis for recommendations to the Congress is a program that will meet the actual and potential needs just as rapidly as possible—taking in order the projects that are closest to realization, pushing them as rapidly as we can, and then proceeding on to others. I think that it is what the real objective of these hearings is and we are very happy that we have all these agencies together here and that we have the harmonious relations among the Chugach and Matanuska and the city of Anchorage at the present time. [Laughter.] Now the Kenai Peninsula Public Utility District should be heard from. Is Mr. Farnen here?

STATEMENT OF LARRY FARNEN, MANAGER, HOMER ELECTRIC ASSOCIATION

Mr. FARNEN. I am Larry Farnen, manager of the Homer Electric Association at Homer. The testimony that I am giving has to do with resources and will not get into the phases which relate to the CAPP organization. I'm presenting it on the part of Mr. Thompson who is manager of the Kenai Public Utility District at Homer.

According to the recent U.S. census the population within this public utility district, which is Kenai Public Utility District No. 1 and covering 54 square miles, is 1,239 persons. The adjacent trading area represents an additional 1,500 persons living on the shores of Kachemak Bay, Cook Inlet, and along the plateau just north and east of the boundaries of our district. The 1940 census showed a population of 325 persons and the 1950 census indicated 725 persons in this area. The rate of increase for the 20-year period computes to 13.9 percent average per year. Actual observations show that the greatest increases in population occurred at two distinct periods and for good reasons. The increases in population during the period 1940–50 occurred during the years immediately following World War II when certain provisions of the Homestead Act allowed veterans to obtain patents with minimal requirements. The period 1946–48 was a time of growth in clearing land under certain agricultural laws that provided payments to veterans for farm training, and so forth.

The period 1950–60 was also a period of growth, though many of the patents issued resulted in dormant land with the veterans moving to other areas, because it was found there were only limited markets for produce and other crops, and surface transportation out of Homer was not available. Construction of the Sterling Highway was started in 1935 and the highway was completed to a gravel surface condition in 1951. In the years subsequent to 1951 the growth of this area has been steady. Prior to 1951 electrical requirements were met on an

individual basis with a majority of the local residents depending upon gas and kerosene lanterns for lighting. The first diesel generation electrical plant was placed in operation in 1951 through establishment of a rural electric cooperative and the Homer Electric Association. The advent of electrical power in the community resulted in attracting many more people to settle on homesteads, numerous additional service businesses were established, and the general welfare of the community was elevated. In 1951 there were 74 business licenses issued in Homer by the territory of Alaska. The 1959 report shows 113 business licenses issued. Correspondingly, the business volume of the community has almost tripled during the period 1952 through June 1959. Gross receipts were $695,920 in 1952 and in June 1959 the report of the department of revenue indicates gross revenues of $2,015,612.

The extent of the resources in the Homer area is not fully known because of the limited surveys and examinations of minerals and other natural resources. Various branches of the Federal and State Governments have made preliminary tests and samplings of coal ores, limestone deposits, and so forth.

To cite a few examples:

1. Development of farming in Alaska continues to grow in the Matanuska Valley, Tanana Valley, and on the Kenai Peninsula from the standpoint of the dollar value of crops produced. Much of the land requires commercial fertilizers to supply the necessary nutrients for good production, where organic fertilizers are not available. Possibilities of a nitrate plant for production of fertilizer has been given consideration, in view of the ready access to materials and potential low-cost power from the site of Bradley Lake. The U.S. Geological Survey Bulletin No. 587 titled "Geology and Mineral Resources of Kenai Peninsula, Alaska," indicates limestone deposits are located along the southerly shore of Kachemak Bay, adjacent to the city of Seldovia. Such deposits may prove to be valuable as blast-furnace flux or for agricultural usage. Accessibility of this locality is considered the most advantageous in this part of Alaska.

2. The chromite ore of Red Mountain and Clam Point have been very appropriately described as the largest known deposits of this type of ore under the American flag. U.S. Geological Survey Bulletin No. 931–G describes these deposits. The estimate if given that there are some 200,000 tons of chromite ore, nearly all of which will require concentration for shipping.

3. The community of Homer has a major problem to overcome, that of drainage of surface water and disposal of sewage. The underlying problem is the fact that there is little vertical drainage in the area, due to the impervious layer of clay a short distance below the surface of the land. Determination can be made that the clay deposits cover a large area in view of the numerous wells that have been drilled for water over a sizable area and the seismological explorations by several oil exploration firms. Several individuals have made tests and found that the local clay has good qualities for ceramic work. Complete analysis is needed to determine potential uses of the clay. Manufacture of bricks for construction may be a good possibility.

St. Augustine Island is approximately 80 miles west of Homer, Alaska, and is near the west shore of Cook Inlet. Large deposits of pumice have been found there, though very little has been done to utilize these deposits for manufacture of pumice block. At last report, which is several years old, the problems of transportation, loading, and unloading facilities had not been resolved. Other uses for pumice have long been known, such as polishing compounds.

Coal resources in the Homer area have been examined in somewhat more detail than any other mineral in the area. Homer Bulletin 1058–F, titled "Geology and Coal Resources of the Homer District Kenai Coal Field, Alaska," describes the chemical analysis of the beds found in the area. The analysis shows that the coalbeds in this region are about equivalent to the Nenana field beds as to production of steam and heating. Several potential uses exist other than use for heating. Low temperature carbonization of this type of coal for a char, gas, and byproduct chemical is a possibility. Also it is considered that a technically possible use would be the hydrogenation or conversion of coal to a synthetic liquid fuel. One major disadvantage is the fact that the Homer coals are just not suitable for coking purposes. Coking is of course of major importance to Japan, since they import about 3 million tons a year from the United States.

Returning to Alaska's greatest resource, the people of Alaska, we believe that the Kenai Peninsula enjoys a favored position in Alaska from the point of climate and scenic beauty. Travel to Homer by residents from all parts of the State of Alaska is open to choice of air travel, surface travel, and water. More and more Alaskans are finding that the temperate climate found in this area is a welcome change from the severe winters of the far north and extremely warm climates that occur in the summer season. Because of the location and natural mountain barriers of the Kenai Mountains, the high-wind trajectories carry the heavy rains away from Homer and give our area an average rainfall of over—only 25.06 inches per year. This is somewhat remarkable considering that a majority of the coastal communities from Ketchikan to Kodiak experience average rainfalls ranging from 50 to 150 inches per year.

Many Alaska residents are learning of this favored location and are planning to retire in the Homer area. Better than 50 percent of the land within the PUD district is owned by persons who do not reside in Homer.

The tourist industry offers a very fine potential for the Homer area, once the Sterling Highway is completely surfaced. As more and more tourists discover that Alaska is within their financial means and that jet travel has reduced the travel time to a matter of a few hours, the demand for increased facilities will greatly increase.

King crab from the icy waters of Kachemak Bay are becoming widely known in Alaska and the Western States. This new industry is expected to provide year around payrolls for fishermen and cannery workers. Presently, there are two small canneries operating at Homer. Construction of the federally sponsored small boat harbor at Homer will provide one of the major tools to develop a steady fishing industry in this locale.

The deepwater port at Homer holds great promise for the western side of the Kenai Peninsula as the communities of Homer, Anchor

Point, Ninilchik, Clam Gulch, Cohoe, Kasilof, Kenai, and Soldatna develop. Now, this small port facility represents 33⅓ percent of the westward Alaska port facilities connected to the central Alaska highway system.

The full significance of the oil industry activities north of Homer in the Soldatna area has not been mentioned previously since we are not aware of the plans of the major and independent oil companies for this area. We note that a dock is being constructed at the northwesterly tip of the Kenai Peninsula and that it is planned to lay a pipeline from the oilfield so that the crude oil can be loaded on vessels for processing at another location. As the perimeter of the drilling activities is widened from the original Swanson River unit, which they have already been widened into the Soldatna River—Soldatna Creek unit they call it—the Homer area will undoubtedly benefit from the increased activities. Construction of a refining plant on the Kenai Peninsula is of course possible, should the demands for petroleum products reach sufficient volume to warrant such construction. However, this is considered doubtful unless much larger markets are found than the current projections.

Production of lumber from the forests on the Kenai Peninsula has long been an active vocation from the earliest history of Alaska. In recent years there have been as many as 35 separate lumber mills operating between Seldovia and Seward. The majority of these mills have not been large producers, due to limited capital, small markets, and insufficient experience of the operators. As the growth in population continues the demands for lumber for home construction will surpass the mill outputs. Currently, the lumber mills on the Kenai Peninsula do not have surpluses of dimension lumber. A number of the mills have found it is more economical to use electricity for their operations rather than use diesel powerplants, even considering the presently high electrical power costs.

Referring to our earlier statements on population of the Homer area, it is quite apparent that this section of Alaska is growing at a rate of 13.5 percent each year. The tax evaluation of this district has increased from $1,034,324 in 1951, to $6,953,170 in 1960.

Technically, we are not equipped to project power requirements for the growth of the area, since we are not engaged in the generation or transmission of electric power. The Homer Electric Association presentation as I explained to you was incorporated with the report from CAPP.

We feel there is a definite need for development of additional electrical power generation for two reasons:

1. Present power rates are very high and do preclude any large volumes of power being used by industrial firms. This, of course, retards development of our resources; and

2. The present supply of firm power will soon be insufficient to meet the needs of the area. Availability of cheap hydroelectric power at the earliest possible date will prove to be one of the main tools for development of the Kenai Peninsula. That is all. Thank you.

Senator GRUENING. Thank you very much, Mr. Farnen. I'm sure the committee will be very glad to get this exposition of the potentials of the Kenai Peninsula, which I think we all agree is one of the most promising areas for development and of course the relationship of

natural resources to power development is an obvious one. The committee is very grateful to you and to Mr. Homer Thompson who has compiled this report.

Are there any other witnesses who wish to be heard? Will you come forward?

STATEMENT OF MASON LA ZELLE, MANAGER, MATANUSKA ELECTRIC ASSOCIATION

Mr. La Zelle. My name is Mason La Zelle. I'm the manager of the Matanuska Electric Association, Palmer. Contrary to my letter to you, Senator, I did not develop any formal presentation for the simple reason that we are signatory to the power pool agreement and we are entirely in accord with the items or feelings suggested in that statement. There are a few things I would like to point out. As far as the Matanuska Valley is concerned, we are possibly the most stable area in Alaska at this time. As you know, from the economical standpoint, the agricultural base there is the largest in Alaska. As for power, we will reach our ceiling that we're allowed under our present power contract with the Bureau of Reclamation by 1961. We have been allocated 3,000 kilowatts capacity by Chugach Electric Association and have acquired the old Eklutna line to carry that to our area. This contract stands until 1964–65 when they predict, as we do, a local generation shortage.

Our own personal feelings are that, of the projects that have been discussed up to this time, Bradley Lake should be pushed as fast as possible but it is obvious, as has been stated here, that it will not take care of the shortage of power. In other words, even if it comes on the line in the shortest possible time, it will still not meet the power requirements that have been forecast. Therefore, there very evidently is going to have to be some interim power.

Matanuska, itself, 2 years ago initiated the study of coal resources in our area and this study is in the process of being finalized now. It indicates, at least at this point, that coal might be quite competitive with the small hydros. Also, you have the gas production area on the Kenai Peninsula which also may be quite competitive, so this field is wide open and the Central Alaska Power Pool itself, of course, has adopted the method of procedure that the cheapest possible source of interim power should be used, whether it's coal, whether it's gas, or what it is.

From the standpoint of the future, Susitna should be developed, too, for two reasons. One is the fact that its increments are quite adaptable to the growth in this area, as we see it now, and also the fact that it includes as part of the project a transmission grid which is going to mean a lot to this country. It's going to be the one thing that will probably have more to do in the near future with developing the economy here from Fairbanks to the end of the Kenai peninsula than any other one thing, and our feeling is that both of these projects should be pushed to the utmost because they all fit in and we feel that by the time Susitna is on the line that the progress that has occurred may well point toward Rampart itself. But as Mr. Retherford said, Rampart, of course, is in the world power category and we're more

concerned right now for the next 10 years probably with our own particular needs. I think that's all that I had to say about it.

Senator GRUENING. Well, could you tell the subcommittee what the present status is of this thermal project? I understand you have a mine mouth project in contemplation.

Mr. LA ZELLE. The present status is that a preliminary survey has been made. It indicated that the present coal prices will not make it competitive. The military buys 85 percent of the coal that's mined in this area and therefore the end product which is delivered and the price thereof is largely controlled by that fact. The product that is being delivered is high quality. It is a washed and graded product and therefore quite expensive.

Senator GRUENING. What mine is this; Eska?

Mr. LA ZELLE. This coal is from two producers in the Matanuska Valley—the Evans Jones Coal Co. and the Mrak Coal Co., both in the same field. The Mrak is more or less the old Eska property and uses the old Eska washery which has been improved. The studies that we are having made now are being conducted by Combustion Engineering and by Babcock & Wilcox, and they are being conducted from the standpoint of trying to ascertain if equipment is available that will use the rejects in the run-of-mine coals that are now coming out of those two properties. If this is the case, then the plant which is located a matter of a mile or two from the properties would be in a very good location to use that type of coal. The coal could be either trucked or it could be hauled by rail to the property.

REA in the first place told us that they could not justify, on our present power requirements as they project them, a plant of larger than 12,650, or posssibly 16,500, kilowatts. Even this size plant would have to be justified on the basis of Chugach's need in the future for the power which we wouldn't use. This was one of the things that actually pointed up to us the great need for an area approach and the committee that was there last year and again this year that advocated that idea, of course, fit right in with these plans. We naturally might feel that coal should be the fuel for interim power, but we only feel this to the extent that it must be competitive. It must be more competitive than any other source of power on a small-scale basis and we are talking small scale about plants from possibly 25,000 kilowatts up, to take us over this next few years' period. That's as far as we have progressed at the present time.

Senator GRUENING. Assuming that this project is deemed feasible and the money could be raised, how rapidly would this get into operation?

Mr. LA ZELLE. The project plant could be on the line within 3 years.

Senator GRUENING. How would it be financed?

Mr. LA ZELLE. Through REA.

Senator GRUENING. Have you approached the REA on this subject?

Mr. LA ZELLE. We have, and we've had a considerable amount of conversation with them. They also advocated an area approach. In other words, as I mentioned before, we and they realize that we can't justify the plant by ourselves. We're a small cooperative. We only have 2,000 consumers and it would need the participation of the other cooperatives in the area. I believe Mr. Moran mentioned that within 10 years after the time such a plant might go on the line, all the

output of that plant would have to be consumed by cooperatives. Up to that time the city of Anchorage would be a possible consumer so the REA has advised us to take an area approach and they are receptive to the idea. I would say this: that from the standpoint of the conversation we have had that, if coal is a feasible fuel, if it's an economical competitive fuel, and if the market can be assured through contract, then the plant could be financed by REA and I don't believe there would be any hesitation.

Senator GRUENING. Well, assuming as I do assume from your statement that this is a necessary interim move, we need certain steps; do we not? We need to have completion of the actual engineering study, the feasibility study, cost study, the assurance that an REA loan will be available, the assent of the other participating agencies such as the Chugach and the city of Anchorage, as well as the Matanuska. Am I correct in stating those as the necessary prerequisites?

Mr. LA ZELLE. This is correct.

Senator GRUENING. Well, I'd like to suggest this to Mr. Moran: Should not this study of these various steps be pursued actively then? I'm assuming that the statement that we're not quite going to make it even if we go ahead full steam with Bradley is correct and that we need something in the meanwhile. Is that a reasonable assumption?

Mr. MORAN. Yes, Senator. In discussions we had prior to arriving at a common statement for the several participants in the Central Alaska Power Pool, we wanted to resolve any differences with respect to the relative merits of various approaches. We usually think in terms of major hydro projects, but we realize that there more time is needed for their planning, design, and construction. We are well aware at Chugach, as I'm sure other participants of CAPP are, of Mr. La Zelle's and Matanuska Electric's interest in mine-mouth generation. We at Chugach quite some time ago, as I think Mr. La Zelle mentioned, adopted a resolution in which we indicated our willingness to purchase power from such a facility. Probably our principal difficulty at this stage, as Mr. La Zelle knows, and we certainly know at Chugach, is that while it is desirable to proceed with these studies, we are proceeding within the limits of our financial ability. Preliminary studies are very expensive and, of course, if they come to naught, they are even more expensive. So I realize that Mr. La Zelle and his cooperative will be just a little bit—not reluctant perhaps—but they have to be cautious so that they don't find themselves overextended in the preliminary investigation. Chugach's principal experiment has been in the field of nuclear power. Chugach invested a very substantial amount of money in exploring the possibilities of participating in the small reactor program of the Atomic Energy Commission. That story, unfortunately, did not have a happy conclusion. We found that it is expensive to participate in giveaway programs.

Senator GRUENING. About how expensive would the studies be of the mine-mouth project, have you any idea, Mr. La Zelle?

FURTHER STATEMENT OF MASON LA ZELLE

Mr. LA ZELLE. Our board originally allotted the sum of $10,000 to carry out the studies that we have underway at the present time. Now

the preliminary studies for the plant have been completed except for the fuel studies. What remains to be done, to decide whether or not the fuels that are available up there at a cost which may be competitive can be used by the equipment that could be incorporated in the plant. Now that's where the study is at the present time.

Senator GRUENING. When you apply to the REA for your loan, does that loan include the cost of this preliminary investigation retroactively or not?

Mr. LA ZELLE. We wouldn't be too concerned about that. In other words the cost of this investigation is actually at the present time being borne by funds which were returned to us from the old CAAPA organization which was also interested in the promotion of power generation.

Senator GRUENING. How rapidly do you think that a firm recommendation on this particular project could be arrived at? We'd like as far as possible to get our ducks in a row and and see how we should proceed. This is apparently the most pressing project in terms of the assumption that, even if we proceed with Bradley Lake at the maximum speed, there will be an interval in which the Matanuska Valley at least will be short of power. Is that a correct assumption?

Mr. LA ZELLE. It is.

Senator GRUENING. I understand that is what your testimony is. Now am I correct is assuming that that does not apply to the other areas under consideration?

Mr. LA ZELLE. My remarks on our own situation were meant only to show our own particular power shortage. We realize as a member of this central Alaska power pool that the whole area will be short and from that standpoint any action that we take will be in accord with the other members of that organization and for the best interest of all of them. Our procedures would be to complete the mine-month studies that we have on this plant to the point where we can as accurately as possible predict what the cost of the power would be and that plan would be submitted to the rest of the members. The participation of those members would be needed before such a plant could be constructed anyway.

Senator GRUENING. Do you believe the recommendations will be ready within the next 2 or 3 months before the opening of the next Congress?

Mr. LA ZELLE. I believe so.

Senator GRUENING. Of course, in making any recommendations to Congress on authorizations we naturally like to have the full picture and know what all the possible alternatives are and exactly what the situation is going to be in the nevt 1, 2, 3, and 4 years and so I think it would be very useful to have that and the works if we can have it.

FURTHER STATEMENT OF WILLIAM J. MORAN

Mr. MORAN. Senator, I would like to make another comment. I'm a little bit biased in favor of the steam-generation approach and the use of coal. My hometown is Parkersburg, W. Va., which has benefited very much by the development of power from coal of which Mr. Bloch spoke.

The Kaiser Aluminum Co. has a half-billion dollar installation at Ravenswood, W. Va., just below Parkersburg, and I know what a

profound effect such development has had on the Ohio Valley. As I understand it, power companies built with private investment a series of very large steam generation facilities along the river, taking advantage of the river itself for bringing coal to the plants. I recall seeing a letter which the Aluminum Co. of America wrote in connection with the Taiya project at the time that it apparently abandoned any further work on it. In that letter, Alcoa took note of the fact that power was being generated from steam in the Ohio Valley at 4 mills and that it would not be possible for Alcoa to compete costwise if it located its plants at great distance from the American aluminum market. I realize that that will be a continuing problem, as Mr. Bloch said, unless we have really cheap power. But in talking of thermal power and use of coal, we're not thinking of the kind of installation which Chugach has here in the Alaska Railroad Reserve. We're talking in terms, as I understand it, of developments that are highly efficient: full condensing, large units which make the most effective use of coal for thermal purposes, as opposed to our facility here where, unfortunately, we are of necessity interested in the production of process steam, which does not permit an efficient plant or low-cost power. But when we did discuss this question as a group, I'd like to stress again, that we believed at that time, if I may crystalize their thinking, that we should by all means proceed with the investigation of thermal power. One of the things that really disturbed us, Senator, is the amount of emphasis we should give to the necessity of going ahead with some of these other projects, which are outside the normal approach of our Federal agencies to public power development. In other words, with the exception of TVA, I don't believe any of our Federal agencies are heavily engaged in the development of steam or thermal generation. Consequently, if we get into that kind of study, we hope, we said in our statement, that the initiation of projects such as Bradley, Devils Canyon, Rampart, and the rest will not be held in abeyance while Congress or the executive department undertake to reassess the whole approach to Federal participation in the generation of power. We believe certainly that we should go ahead with the study of thermal and other types of generation, but we hope that Congress will not sit down, or the executive departments either, and want to reassess their whole thinking on the subject of power development and neglect the hydro projects.

Senator GRUENING. I share your hope. Are there any other witnesses who want to be heard? I'd like to go back to the question of sequence here. I'd like to assume that we have established that there is a pressing need for power, that there's a need for power even before the project that is most nearly ready to go, namely the Bradley Lake project. That that is the project that is most ready to go and is most likely to satisfy the needs say beginning 4 years hence assuming that we can get the authorization and appropriations from Congress for which, of course, every effort will be made. Then the next question is what steps should be taken now, what preparation for the next phase. I'm wondering, before we go on to the major projects such as Devils Canyon and Rampart, whether we might discuss Chakachamna to the extent that the information is available. I would assume, and I would be glad to be contradicted while it's discussed, that just as soon as Bradley is under operation we will still be facing

in the not distant future, another shortage and that we still will have an interval of possibly 6 or 7 years before the larger projects come into being. Meanwhile we should be at work on a second project of approximately the type of Bradley or somewhat larger such as Chakachamna. Is that a correct assumption, Mr. Dominy?

FURTHER STATEMENT OF COMMISSIONER DOMINY

Mr. DOMINY. I think from the material that's gone into the record here this morning, Mr. Chairman, that no matter what project of the hydros that's being considered now, whether it be Devils Canyon or Bradley Lake or even Chakachamna, that power shortages will be felt prior to that project being completed and the transmission facilities available to bring power to the consumer. I think it has also been brought out here quite clearly that a project the size of Bradley Lake would be only of temporary assistance to meet the anticipated growing needs of this area. The Chakachamna project may have as much as 400,000 kilowatts potential in its full capacity. We're not certain as yet and won't perhaps know until we get at least one more year of record on the available water, but it looks like it could have that much potential for its full capacity. I've already testified in detail that Devils Canyon would provide a considerable quantity of power over the long pull with the transmission system interconnecting the railbelt area which I think all of us agree would be a highly desirable feature. Now if the Chair wishes, I'd like to suggest that Mr. Roberts might go into a little more detail as to the possibilities of Chakachamna and at Devils Canyon.

Senator GRUENING. I'd be happy to have him do so. I would like the discussion as far as possible from now on, although other things might come up, to try to outline a series of steps. We are trying to plan for the immediate need and the needs thereafter and the long-range needs. If we could tentatively develop some sort of a schedule or program, that could be very useful. Mr. Roberts, we'd be very happy to have you say whatever you think is pertinent.

STATEMENT OF AREA MANAGER DARYL ROBERTS

Mr. ROBERTS. In making our power market study for the Devils Canyon project we evaluated it in this respect: In order to estimate the foreseeable power needs as they develop, we projected the historic load growth which averaged a little over 10 percent a year. To meet the growth would require building a project about the size of CEA's 14,500 kilowatt steamplant about every other year. We don't think this is desirable or would be the thing to do as the market is pyramiding so fast—that it's only logical to get a larger size project developed. Bradley Lake will fit in very well and I was interested in hearing what Harold Moats had to say this morning regarding the cost of power at the bus bar. I think the power at bus bar is going to be very comparable to the cost of power from Devils Canyon at the bus bar. The difference will be that we have to build quite an expensive transmission line which is something we all recognize that we need but it raises the cost of power.

Senator GRUENING. You are speaking of the transmission line from which site?

Mr. ROBERTS. From the Devils Canyon site serving both the Fairbanks area and Anchorage area. Our study recognizes that the railbelt area should be tied together. Fairbanks is now paying high rates for power. So, therefore, we consider that the Susitna would be the logical project to pursue next. Or, if we're not going to look to an overall railbelt development, possibly Chakachamna should come in, but I do not feel that Chakachamna project will show that it can be saddled with the expensive transmission line involved in serving the entire rail-belt area and still get us the low-cost power desired. It will be relatively low-cost power in my opinion but, of course, we have not developed the study sufficiently to come up with any mill rate. I would say it has a good possibility of being the cheapest power that we could possibly get in here aside from a larger development.

Senator GRUENING. Which would be the cheapest?

Mr. ROBERTS. Chakachamna project power, if we did not saddle it with a rail-belt transmission line, which is needed. And needing the transmission line, I think it only logical to build Devil Canyon project first, because it would serve the overall need of the region. It would provide the interconnection with the existing systems at Fairbanks, Anchorage, and Kenai Peninsula, and would do the overall job that is needed. I also think we should recognize that the Anchorage area is going to experience a power shortage around 1964. Therefore, it is my opinion that the coal-fired steamplant discussed earlier is possible as a first move. Then to meet load growths, Bradley Lake might be desirable, or if not Bradley Lake there would be a pressing need for Devils Canyon or Chakachamna project.

Senator GRUENING. Would Chakachamna be transmitted under Cook Inlet by cable or around the upper end and back?

Mr. ROBERTS. Well, we haven't made the transmission line location yet but the present thinking would be that it would be a submarine cable crossing Cook Inlet.

Senator GRUENING. Well, the question that arises in my mind is this: Let's assume that we have Bradley, which at best if we can get all the forces to cooperate and get authorization and appropriation, would be completed about 1964. Now assuming that we went ahead with Devils Canyon or Rampart, that would be a matter for possibly 10 years at the best from now. I believe 1969 was mentioned as the best possible date for Devils Canyon. Now wouldn't it be desirable to have something in between that would be completed say about 1966 and would take up the slack? I have in mind that Chakachamna might be just that.

Mr. ROBERTS. That is true. Chakachamna is a project that could be pushed through rather rapidly because it involves only a tunnel, a powerhouse, and a transmission line. It would be comparable to the Bradley Lake project that we are talking about except Bradley Lake requires a dam. Chakachamna does not but it does have a longer tunnel. Those tunnels can be pushed rapidly by working from several adits. In other words more than one heading will expedite the work so Chakachamna could be pushed rather rapidly if the money and the program was set so it could move in that respect. So it could be developed in a matter of 4 or 5 years at the most.

Senator GRUENING. Well, wouldn't that tend to fill in this gap which we can reasonably anticipate will take place after the completion of Bradley and the completion of these larger projects, whichever one seems to be the more desirable—either Rampart or Devils Canyon?

Mr. ROBERTS. Well, I believe Devils Canyon project is the proper one to develop. I think it fits best into the rail-belt economy, as it is adaptable to area load growth—through stage development. The stage development effect of adding power dams one at a time on the Susitna River can be geared to meet the load growth of the entire rail-belt area. The Bureau has been interested in the overall picture in the territory, not only serving Anchorage area but helping out the Fairbanks people. There are no projects in the Fairbanks area outside of Rampart that would bring about low-cost power. There are a lot of small projects up there but you cannot come out with low-cost power on these small projects because of the high cost of developing—the overhead—and everyone, I think, will recognize that. So our point is this, we feel that we should look not only to the Anchorage area but to the Fairbanks area and the rail-belt area as well in the overall development picture. In order to take care of that we need a project like the Devils Canyon and I think the sooner we get it underway the better off the State is going to be.

Senator GRUENING. How much would you estimate Devils Canyon would cost?

Mr. ROBERTS. Well, our construction costs are rough now. As the Commissioner mentioned this morning, we're still looking at some costs. The figure we have on it now I will tell you, but would want the opportunity to change it, is about $498 million for overall construction costs which includes the two dams and transmission to all rail-belt cities.

Senator GRUENING. $498 million?

Mr. ROBERTS. Yes, sir.

Senator GRUENING. You mean half a billion.

Mr. ROBERTS. That's right, pretty close.

Senator GRUENING. It sounds less when you say $498 million. [Laughter.] What would be the total installed capacity?

Mr. ROBERTS. Well, as was mentioned this morning by the Commissioner, it would be 580,000 kilowatts.

Senator GRUENING. Well, how would you think that would compare in overall usefulness with a project that would cost perhaps twice as much, maybe a little more, a billion or a billion and a quarter, but would have an installed capacity 10 times as large and a much lower rate?

Mr. ROBERTS. Well——

Senator GRUENING. That would be the case in Rampart.

Mr. ROBERTS. I don't know if I'd want to comment on that.

Senator GRUENING. Why not?

Mr. ROBERTS. I would say that if you had a market for the Rampart project to sell all the power, you might come out with a cheaper cost. As I understand it, it will take a billion and a half dollars to develop Rampart.

Senator GRUENING. It wouldn't be fair to say, but I suspect it would cost a billion to a billion and a quarter, possibly a billion and a half.

Mr. ROBERTS. Well, we're dealing in a lot of money all right.

Senator GRUENING. Well, either one is a lot of money, in the terms of the Congress. Colonel Hanburger, I wish you'd comment on this overall situation just as Mr. Roberts has and give your views on it. We're trying to arrive at a tentative program for the next decade which will take care of the immediate needs, the postimmediate needs, and the long-range needs and, we have, I think, pretty much arrived at the conclusion that we need Bradley very badly. We need it immediately. We perhaps need something before that, but we need Bradley in any event. Now the question is: What's the next best step after that as you see it?

FURTHER STATEMENT OF COLONEL HANBURGER

Colonel HANBURGER. I'm not prepared this morning to select the project or the type of project that would reach your interim period—that is the period between such things as the Bradley Lake project and then another extremely large project. That I think would require further study on our part to pinpoint it. There have been some very good suggestions here this morning and they have been from different agencies. The figures are all available to us as far as they have been developed and I feel that further study should be undertaken before a definite recommendation is made as to what might be the project that should be selected for the interim period.

Senator GRUENING. General Clark?

FURTHER STATEMENT OF GENERAL CLARK

General CLARK. Senator, in our Bradley Lake studies which was the title that was put on it, we did examine the other possibilities, what appeared to be reasonable possibilities in the Cook area—Cook Inlet drainage area. In a quick count this morning, I think there were 19 projects which were discussed. Most of them on the order of Bradley Lake or smaller. Well, they ran—I guess the smallest one actually was 1,000 kilowatts.

We did not try in that report to take out the second best. In other words we came to the conclusion that Bradley Lake was best but we did not try to pick out the second best. Perhaps one of the things to do is to undertake a more detailed study and to come up with a second best.

I'm assuming now Senator that what we need—that what you're aiming at really—is a series of interim projects which will meet the local need reasonably and leave some reserve over short of the large Devils Lake or Devils Canyon-Rampart type of development which I'll call developmental.

Senator GRUENING. That is correct. I would suggest that we're not trying to find the second best but the second next.

General CLARK. Well, I think that if we assume that, if our assumptions were correct—out of the 19 or 20 projects that we looked at, the one best suited to meet the immediate need in terms of time and construction and number of kilowatts was Bradley Lake. We need now to take another look at what should follow Bradley Lake. These all have to be analyzed in terms of feasibility and economic feasibility as well and there is a tremendous amount of hydroelectric potential

but it's got to be studied before you can say positively that, this is the next project and then we should plan to do this following that and I don't think that our—from the corps' point of view our planning is not far enough along in the succeeding projects to really make a recommendation.

Colonel HANBURGER. That is essentially correct. We think Bradley as being the one project that would come the closest to meeting this forecast shortage. We did not pick the next project to meet the following shortage developing so that we do require further study.

Senator GRUENING. Well, I think we have a reasonable period of grace in which we can proceed to the study of the next best project because I think we can safely assume that Bradley is now a first priority and a must if we can get the Congress to approve it, then in the next year or two we can develop studies on Chakachamna and Nellie Juan and see which is the next best. I feel, under any circumstances, that there will be an interval of several years when we will be very short of power when all the Bradley power is used up. We should try to guard against that situation because that will probably be the period when there will be intensive industrial development here and the kind of growth that we can reasonably hope for and anticipate. I do think that we've got to make a very serious comparative study of the value of both Devils Canyon and Rampart. I find it a little bit difficult to imagine that a Congress would authorize both. I think we've got to review the comparative costs, comparative amount of generation, and so forth. I think it is probably correct that Rampart would supply power at a much lower cost than Devils Canyon. I noticed that I think it was you, Mr. Dominy, that estimated the cost of Rampart at about 4 mills?

Mr. DOMINY. I only inferred that as a preliminary estimate.

Senator GRUENING. I have heard it given as a lower figure although I imagine that is by no means determined precisely.

Mr. DOMINY. As I understood, that estimate was based on the full utilization of the complete capability of the plant.

Senator GRUENING. Well, I have heard some authorities indicate that the cost of the bus bar might be 2 mills.

General CLARK. Actually, Senator, we have a statement for the Fairbanks area and if I may qualify it with all of the qualifying phrases I can think of, of being preliminary and based on assumptions and various other things including some assumptions as in regard to the cost of transmission. That statement which we're prepared to give at the next hearing indicates that the bus bar, that is with full utilization, that bus bar cost will be on the order of 2 and transmission might be as low as 1 or around 1 and therefore the cost is somewhere in the 3 mills for this area.

Senator GRUENING. Congress would naturally want to weigh the comparative costs and advantages and pros and cons of the major projects. As we all know, undertaking such a project is not simple. You remember the great difficulties that we had in some of the larger Western projects. I think the time is coming, however, when there will be a full appreciation by Congress of a necessity of doing these things. We have the example or the picture of what's being done across Bering Strait in Siberia and I hope that there will be an equal awareness of our needs in the Western Hemisphere.

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General CLARK. Senator, as a division engineer in the North Pacific division, I have the responsibility for the Columbia River Valley and I have a deep appreciation for the controversies that you get into on these large projects. [Laughter.]

Senator GRUENING. Yes. It will take a good deal of time to get even the most obviously necessary things. I didn't anticipate that we would get this far in this morning's hearing. If there is any desire to have us resume these hearings this afternoon we can do so but I have a feeling that we have pretty well covered the subject for the time being. I understand the plan is to inspect these various projects tomorrow, weather permitting. If weather doesn't permit, Colonel Hanburger, can we postpone it to Friday?

Colonel HANBURGER. I'll be glad to talk to the Air Force and see what can be arranged.

Senator GRUENING. Very good. I would like very much before we adjourn not to forget the Cordova needs. What agency would be the proper one to make a little study of that hydro project near Cordova? Would that be within the Bureau of Reclamation or would it be the Engineers?

Mr. DOMANY. Well, I think in our overall reconnaissance study that we did look into that on a very reconnaissance basis. It was not too hopeful in terms of feasibility.

Senator GRUENING. Well, is there anything else over there that could be used? I suppose if we develop these larger projects why of course this entire area will be included in the grid, but I hate to think of Cordova waiting all that time.

FURTHER STATEMENT OF R. A. BODDINGTON

Mr. BODDINGTON. If the Woods Canyon Dam was gone ahead with we would be in the natural line of transmission.

Senator GRUENING. What do your fishermen think about Woods Canyon?

Mr. BODDINGTON. Well, I'll tell you. The amount of fish they are catching now, I don't think that they would mind a bit. [Laughter.] I'll tell you I have flown that country quite considerable and there would be an inland waterway there of some 70 or 80 miles which would give access to a country of which no man I believe has ever trod as yet. There is timber and probably minerals of all kinds back in that country. I've flown it four or five times.

Senator GRUENING. Would that destroy this beautiful highway going up the Copper River?

Mr. BODDINGTON. Yes.

Senator GRUENING. That would be a great pity. I think some of our scenic enthusiasts and conservationists would have some objection. How far into the Chitina Valley would you have to flood?

Mr. BODDINGTON. You would have to go back there 40 or 50 miles,

Senator GRUENING. Well, I think that is a good subject for us to leave alone for a while. [Laughter.] Are there any other comments?

FURTHER STATEMENT OF LARRY FARNEN

Mr. FARNEN. Senator, I am Larry Farnen from Homer. I would like to reemphasize one point that was made here this morning on this

problem of the needs of small communities. Now we've all talked about what these big power needs are. Mr. Retherford has pointed them out to you. I would like to see some of these agencies get into this problem of small blocks of power generated for small communities. For instance in the Bradley Lake development you have Seldovia sitting over there that needs power. I don't know whether this has been considered by the corps. You have many of these small communities throughout Alaska which you are very familiar with but I would like to see this problem given real study. We have a tremendous sanitation problem to increase the living conditions of these people, make for better health in these communities. For the small community, this is a real problem in Alaska, and I think that probably many people here are aware of it. I would like to reemphasize that and see if we couldn't do a little more work also in this line.

Senator GRUENING. Has Seldovia got a diesel plant now?

Mr. FARNEN. Yes, sir. They have a diesel plant. It is privately owned. It is a very high-cost power of course.

Senator GRUENING. True. Well, if we develop this power in the Kenai Peninsula, Seldovia certainly would not be outside of the transmission range. You could send a cable under Kachemak Bay, and around.

FURTHER STATEMENT OF WILLIAM J. MORAN

Mr. MORAN. Senator, I would like to make just one other comment. I made reference in my statement to the report of the Technical Interagency Power Group which made a reconnaissance power survey in the Anchorage-Fairbanks or rail-belt area in Alaska. As you may recall, I mentioned that this report was made to the Director of the Office of Civil Defense Mobilization in the spring of 1959. I'd like to make reference specifically to one recommendation which is contained on page 7 of the report. It's item No. 3. With the Senator's permission, I will read it. It says:

> Planning should be started for a transmission line of 115 kilovolts or higher. The line when constructed will serve as (*a*) an interconnectiton for Anchorage, Fairbanks, and Big Delta; (*b*) provide an outlet for mine-mouth steam-electric plants which might be constructed near Healy, and hydroelectric developments on the Susitna and Nenana Rivers and their tributaries; (*c*) supply power to isolated electric systems located along the proposed transmission route; (*d*) supply construction power during the building of future projects; (*e*) provide sources of backup power for the site at Clear; and (*f*) provide an outlet for the experimental atomic power being developed at Fort Greely.

The chairman of this committee is Art Vieregg of the Department of the Interior. The other members are Mr. Hughes of the Federal Power Commission, Mr. Beshers of the Department of Commerce, Mr. Grimm of the Office of the Secretary of Defense, and Mr. Ginsburg of the Office of Civil and Defense Mobilization. This recommendation reflects their thinking.

Senator GRUENING. What was that report?

Mr. MORAN. What is the report?

Senator GRUENING. Yes; what is it?

Mr. MORAN. It is the report of the Technical Interagency Power Group, dated June 29, 1959.

That same group, or at least a group, it may not have been the same people—Mr. Vieregg I know was along—was here again this year. I don't have their report as written this year, but I have no reason to believe from talking to them that it would be substantially different. It would probably only be brought up to date.

What I want to stress is that they have recommended this intertie without reference to any specific project. I wish to suggest to the committee that consideration be given to constructing this intertie between Anchorage and Fairbanks without regard to any particular project that might be constructed. In other words, it appears to me that these gentlemen, who are quite qualified to make recommendations of this sort, have found it desirable to build this grid without reference to Bradley, or Devils Canyon, or Rampart, or any other specific generation project. It is needed right now and I wish to suggest that the means be found to build such intertie or grid. Let it go ahead immediately without reference to what may be done with any other particular project.

Senator GRUENING. I think it would be very useful if you would file that report with the committee for its study.

I'd like to ask you how this intertie is going to be paid for, what's the proposal?

Mr. MORAN. Well, unfortunately, Mr. Vieregg didn't give us the answer to that and I don't know which one of the several Federal agencies might be considered the sponsoring agency for this type of a project. Mr. Vieregg is from the Department of the Interior and these others represent other departments having an interest in Alaska's development, particularly the military, so I assume that it was intended that it would be a project of one of the Federal agencies, sponsored and perhaps justified completely under an Office of Defense Mobilization approach, because of the very grave importance of that area to our defense posture.

Senator GRUENING. Well, I think we all look forward to an all-Alaska grid one of these days and this might be the first step in that.

Mr. MORAN. I have a very battered verifaxed copy that I'd be happy to leave with you.

Senator GRUENING. Now, I want to make sure that no one here is foreclosed from testifying. If anyone has any second thoughts, I want to be sure he has an opportunity to be heard. If not we will recess this hearing.

Those of us who are going on the plane will meet at the place to be announced. I think there is a total of 11 places which we are trying to distribute as equitably as possible and then we will resume the hearing for the Fairbanks area.

I thank you all very much for this very valuable testimony.

(Thereupon the hearing was recessed, subject to the call of the Chair.)

HYDROELECTRIC REQUIREMENTS AND RESOURCES OF ALASKA

TUESDAY, SEPTEMBER 13, 1960

U.S. SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION OF THE
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Fairbanks, Alaska.

The hearing convened at 9 a.m., Tuesday, September 13, 1960, at the courthouse, Fairbanks, Alaska, Senator Ernest Gruening (acting chairman of the subcommittee) presiding.

Also present: Goodrich W. Lineweaver, professional staff member, Committee on Interior and Insular Affairs; and Antoinette Friedman, special assistant.

OPENING STATEMENT OF SENATOR ERNEST GRUENING

Senator GRUENING. Today we hold the second of a series of hearings of the Senate Committee on Interior and Insular Affairs on needs for low cost power in Alaska and on the resources of the State to meet those needs. A study of this kind is long overdue.

For entirely too long one of the most precious resources of Alaska—its natural supply of low cost hydroelectric power—has been wasted while the development of Alaska has suffered for lack of the very low cost power this resource could supply.

The citizens of Fairbanks and vicinity are well aware they pay too much for electric power. The cost is now entirely too high, despite the nearby great storehouse of hydroelectric power which is the Yukon River. It is the purpose of this study to determine what Federal legislation is needed to unlock the storehouse of power in the Yukon, as well as at other locations in Alaska.

IMPORTANCE OF RAMPART CANYON DAM

At Fairbanks, of course, the development of hydroelectric power cannot be considered without discussing the proposed Rampart Canyon Dam. This great dam, which could be the mightiest in the world, would have an installed capacity of nearly 5 million kilowatts, and could produce power at the low rate of 2 mills per kilowatt hour and would create a reservoir approximately the size of Lake Erie. As Senator Kennedy has said, it could light the cities and farms of Alaska from Fairbanks to the Kenai Peninsula and beyond as far west as Nome, and to southeast Alaska, and provide for the development of industry on a scale greater than anything now in existence in the free world.

While it will undoubtedly be some years before Rampart is a reality, it is not too soon to plan for this hydroelectric power development and to do everything possible to speed up its realization.

For Fairbanks, Rampart Canyon Dam would mean a great surge of economic growth. To Fairbanks would come the people who would build the dam, and to Fairbanks would come the first fruits of the electric power it will make available.

While we shall consider the potentalities of Rampart, we must not lose sight of the fact there are immediate needs for low cost power which cannot await the construction of that project. Alaskan cities, including Fairbanks, are beginning to suffer from a lack of power which must not be allowed to continue or grow worse. With the large number of potential hydroelectric power sites in Alaska, we must determine which of these can be developed soon enough to provide the power which will be needed in increasing quantities in the immediate future.

In addition to consideration of hydroelectric projects, we must consider alternative methods of producing power, such as natural gas, thermal generation with coal or oil, and nuclear power. Our purpose is to arrive at solutions to problems of power shortage wherever they may be found.

I welcome your cooperation in this study, and hope it will prove to be of benefit to the State of Alaska.

TELEGRAM FROM REPRESENTATIVE RALPH RIVERS

Before we proceed to the witnesses, I have here a telegram from Representative Ralph Rivers. It is short, and I will read it and then it will go into the record at this point.

In reference to Senate committee hearings which you are conducting on the subject of speeding development of hydroelectric power resources of Alaska, please permit me to go on record, through the medium of this message. I wholeheartedly endorse all steps to accelerate the progress of Rampart Canyon, the greatest potential hydroelectric project on this continent. For creation of cheap power, susceptible of being made available through high voltage transmission to American industry at numerous ice-free harbor sites in Alaska, and to Alaska cities and other settlements within a widespread area.

Significantly, Rampart Canyon is America's ace in the hole for defense industries, as well as the greatest of our country's few remaining sources of cheap power available to solve the power shortage which will ensue because of our exploding population should we fail to proceed vigorously in a timely manner to meet more immediate local needs. I also stress the importance of a speedup of the development of smaller sites, such as Bradley Lake near Anchorage, and the Snettisham project near Juneau, and others.

Sincerely,

RALPH J. RIVERS,
U.S. Representative, Alaska.

Now the first witness today is the Hon. Paul Haggland, mayor of Fairbanks. Is Dr. Haggland here? Yes he is. Will you come forward Doctor. And I would like to suggest to the witnesses that first of all they give their name and position, and talk right into the microphone.

STATEMENT OF MAYOR PAUL B. HAGGLAND, FAIRBANKS, ALASKA

Mayor HAGGLAND. I am Dr. P. B. Haggland, mayor of Fairbanks. My remarks may not be technical, Senator Gruening. It is a pleasure to have you here, and on a most welcome subject, to all your committee and guests who are here today. I think power is one of the most important things we are concerned with in the interior today. I have seen in my own time the use of a thousand kilowatts, plus a little added in the wintertime, jump to a city municipal plant of a maximum of a little over 8,000 kilowatts and we are still short.

I would anticipate in the future that a lot of thought should be given in this community to a public utility district that would encompass both the REA, the municipal utilities, and the entire area. I realize the Rampart project is a great undertaking. It requires a lot of study, from an engineering standpoint, bionomics, and also from a geological consideration, particularly that we do not cover a valuable mineral asset, whether it be a rock mineral, gas, or oil, by flooding it with water. I think also that we have to be concerned with possible changes in meteorological behavior here in the interior. However, such great bodies of water exist in the North—Great Slave Lake, Great Bear Lake—so I don't believe that would create too much of a problem. I requested, through our city manager, that Mr. Haller, and also of course the others who are concerned with electrical power here, appear before this committee. They have more concrete facts to submit, I am sure.

So at this time I would say again, it is a great pleasure to have you here Senator Gruening. It is a great project, and it will mean a lot to Alaska, and it ought to be well planned. I also look at it from this view. We have a fine university out here that can provide the technical ability, if funds are provided to study the bionomics of that basin, and also the geology. Thank you.

Senator GRUENING. Thank you, Dr. Haggland. I am so glad to say in connection with your mention of the university that President Wood is here, and I know he will be very much interested in what develops here, and in the part the university can play in this and other important undertakings in our 49th State.

The next witness is Mr. George Haller, chief of public utilities, of Fairbanks.

STATEMENT OF GEORGE HALLER

Mr. HALLER. Senator Gruening, I am George A. Haller, general manager of the municipal utilities system of Fairbanks.

Senator GRUENING. We will be happy to hear you, Mr. Haller.

Mr. HALLER. Senator, we would like to emphasize the interest of both the Golden Valley Electrical Association and the municipal utilities boards, respectively. We fully and wholeheartedly support the Rampart development. However, this morning, we are going to concur in the remarks to be made by Mr. Brene Canaday, of the Golden Valley Electric Association. We have worked very closely together, and we want to urge, very emphatically, that we will be required to have at least about 8,000 kilowatts of firm energy within the next 5

years. If we cannot have that developed on the Nenana, then we will have to go to high cost steam power.

Our fuel costs per kilowatt-hour developed would be over 1 cent. I think that is very impressive because it stresses the fact that we do need hydropower. Now we have 8,150 name-plate rating capacity in our plant, and along with the GVEA a 13,000 total. We expect our 8,150 to jump in 1965 to 12,000 kilowatt peak demand. In 1959 we developed 32,800,000 kilowatt-hours, and we expect that to go to 46 million in 1965.

Now the Jack River site, on the Nenana. I have not visited with the Corps of Engineers on this fact, but it is my understanding from Mr. Canaday that preliminary investigation on that site would cost about $35,000. And that it would develop approximately 9,000 killowatts. Now I would like to interject here at this time the thought that that is what we would like to urge that we need: the intermediate step. And anything that your committee can do, anything the corps can do, anything we can do, to expedite the study and the analysis of the Jack River site, or the Nenana site, which I understand will develop about 24,000 kilowatts, we will certainly appreciate. I think that will conclude my comments at this time, Senator, and I will be in the audience if there are any questions to come later.

Senator GRUENING. Thank you, very much, Mr. Haller. One of the purposes of this hearing is to find out what the intermediate needs will be, before the larger project that we visualize will come into being. And that is a specifically important thing that we want to hear testimony on today.

Mr. HALLER. Thank you Senator.

Senator GRUENING. The next witness will be Mr. Brene Canaday, manager of the Golden Valley Electrical Association.

STATEMENT OF BRENE CANADAY

Mr. CANADAY. Senator Gruening, I am Brene Canaday, of the Golden Valley Electric Association. The Fairbanks Municipal Utilities System, and the GVEA system are the agencies presently generating and distributing electricity in the greater Fairbanks area. The Golden Valley system also extends along the Richardson Highway, past North Pole and to and beyond Delta Junction to the south. It is probable also that our service areas in the future will be extended in the Nenana River drainage area. We have agreements in effect, and being negotiated, under which we, the Municipal Utilities and the military, are pooling our generating resources to meet the area requirements.

At present, the steam generating stations of Golden Valley, and the Municipal Utilities System, aggregate 18 megowatts in nameplate rating. Our combined system load in 1959 was 12 megowatts, and the firm capacity only 13. The average costs of generation for both plants is 22.3 mills per kilowatt-hour at the bus bar. Average cost for all classes of Golden Valley consumers is 6.4 cents per kilowatt-hour, and 5.8 cents for the city of Fairbanks customers. Estimates for future electrical requirements in our service area are based on the high cost steam generating energy, as shown in the following table and on the attached graph. The availability of lower cost hydro electric

power would undoubtedly increase the usage of electricity above the figures shown here, as follows:

[Megawatts]

Year	City of Fairbanks [1]	GVEA [2]	Total [3]	FPC [4]
1960	9	5	14	14
1965	14	9	23	20
1970	23	16	39	28
1975	38	28	66	35
1980	61	50	111	45

[1] Based on 10 percent annual growth per FMUS estimates.
[2] Based on 12 percent annual growth per GVEA estimates (average of past 6 years).
[3] Does not include Nenana or Healy areas.
[4] From "Alaska Power Market Survey," Federal Power Commission, May 1960.

Obviously, by even the most conservative estimates, additional generating capacity will be required in this area in the very near future. By 1965 we will require an additional 9,000 kilowatts and by 1970, another 16,000 kilowatts in addition to the requirement of the Nenana-Railbelt area. To meet these requirements there are two possibilities:

1. Additional steam generation could be provided at Fairbanks for a cost of approximately 20 to 22 mills per kilowatt-hour. A mine-mouth steam plant located on the Railbelt could deliver power for a somewhat lower figure.

2. Hydroelectric development of small or moderate size.

The Nenana River hydroelectric development appears to fulfill the requirements for interim generation for the Fairbanks area in that—

1. It is situated within a reasonable distance of the Fairbanks load center.

2. Cost of power generated would be considerably below that of steam although, of course, not comparing with Rampart.

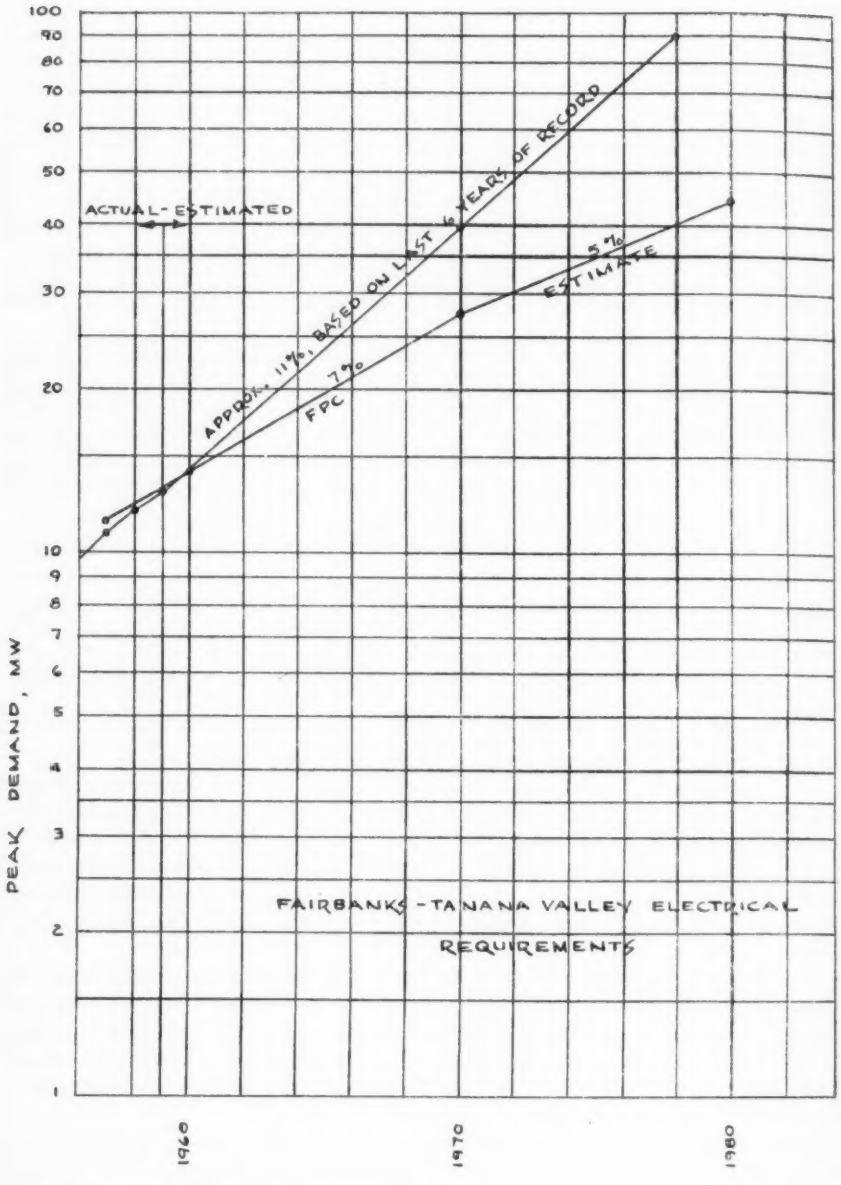
3. It is capable of development in stages to follow, economically, the area load requirements, with an ultimate capacity of 150 megawatts.

4. It lies between Fairbanks and the Cook Inlet area, so that transmission lines from the Nenana River to Fairbanks would also serve as links in a transmission system tying together the two major load areas.

We believe the Susitna project fails to meet the requirements for interim utility generation because of its very high initial cost and long construction schedule. Also, the cost of power would be too high to attract electrochemical industries. Instead, we endorse the Rampart project as the long-range development to provide low cost power for both utility and industrial use.

Therefore, we urge that investigations to determine the feasibility of the Nenana River hydroelectric development be pursued with dispatch. Particularly, we urge completion at the earliest possible date of the detailed studies necessary to determine the economic and geologic feasibility of the initial stage of development, followed immediately by construction of the first stage.

The following graph illustrates the estimates.



Thank you, Senator Gruening.

Senator GRUENING. Mr. Canaday, do you have any other projects in mind, for the interim needs, besides the Nenana?

OTHER PROJECTS MENTIONED

Mr. CANADAY. Yes, sir. A project has been mentioned in the Cathedral Bluffs area. As I remember, offhand, only very preliminary

work has been done. I believe that the capacity would be in the neighborhood of 100,000–150,000 kilowatts. Other than that I know of no projects in the interior which would appear to be feasible at this time.

Senator GRUENING. Thank you very much, Mr. Canaday. We would next like to hear from the Corps of Engineers.

STATEMENT OF COLONEL HANBURGER, CORPS OF ENGINEERS

Colonel HANBURGER. Senator Gruening, I am Colonel Hanburger, district engineer, U.S. Army District, Alaska. The comments I shall make at this time pertain to the Nenana River project.

Late in August 1960, the Senate Public Works Committee passed a resolution directing the Corps of Engineers to make a survey of the Nenana River, in order to determine the feasibility of hydroelectric power generation. Prior to this time a number of the Nenana River sites have received varying degrees of investigation by both the Federal Government and, in some cases, local interests.

Efficient development of the Nenana River would probably require seven dams. These dams, located in an order progressing downstream, would develop approximately prime capacity and provide installed capacity as follows:

[In kilowatts]

	Continuous output	Installed capacities		Continuous output	Installed capacities
Nenana site	16,000	24,000	McKinley site	33,000	63,000
Jack River site	9,000	13,000	Moody site	13,000	20,000
Carlo site	25,000	25,000	Slagle site	19,000	30,000
Yanert site	35,000	62,000			

The total prime power available from this scheme would be about 150,000 kilowatts, while the installed capacity would be about 237,000 kilowatts. The figures presented above are based upon an informal review of the Nenana River potential of 1958. Final formulation of this plan awaits the survey authorized this year.

Of the several sites under consideration, only two headwater sites, the Nenana site and the Jack River site, would have sufficient storage to operate other than as run of river plants. Of the seven sites, the Nenana site, from a storage and operation standpoint, should be the first for development. As further projects are constructed, the Nenana project might be utilized primarily for storage during the summer months, delivering its 24,000 kilowatts continuously throughout the remaining 8 months of the year.

The other site on which particular investigations have focused is the Slagle site. A Federal Power Commission permit has been obtained to develop 5,000 kilowatts of power during the summer from a run of river plant. Provisions will be made to increase the installation to the neighborhood of 30,000 kilowatts, depending upon the development and availability of upstream storage.

The Nenana River appears to present the best source of relatively small hydropower production for use in the Fairbanks area. It allows for incremental development to meet the growing needs and with each addition will provide power at a decreased rate of cost. Our survey

report will present the overall plan believed to provide the maximum potential of this stream and will contain the recommendations of the Corps of Engineers regarding the incremental development of each site in its most efficient manner.

COORDINATION WITH FISH AND WILDLIFE SERVICE

Studies will be coordinated with the U.S. Fish and Wildlife Service to insure the protection and perhaps enhancement of any existing anadromous fish runs. Their studies will be conducted in conjunction with ours however, and apparently there are no existing fish problems. In the meantime, any development brought about by private interests will be under Federal Power Commission permit and will be tied in as far as practicable with the maximum development of the resource.

Senator GRUENING. Thank you very much Colonel Hanburger. I would like to ask you a few questions. How long will it be before the survey which has been authorized is completed?

Colonel HANBURGER. Depending on the availability of funds, sir, I think that survey should be completed in 2 years. Before we complete the entire survey we would have, without a doubt, an interim report covering the site selected for primary investigation.

Senator GRUENING. How much money are you going to request for the investigation?

STATEMENT OF HAROLD MOATS, CORPS OF ENGINEERS

Mr. MOATS. We are not absolutely certain on that figure yet, Senator. We are analyzing it completely in our office in Anchorage, and will have a figure on it in the next few days.

Senator GRUENING. Well, assuming the utmost generosity on the part of Congress, and the greatest celerity on the part of the corps, how rapidly do you think this first project could come into being and start generating this needed power?

Colonel HANBURGER. Sir, at this time we do not have enough data to give you a firm figure on that, but to look at it on a very rough basis, I think that we could assume that we could have a report ready to be presented for approval in a little over a year. Allowing, perhaps, up to a year for approval and authorization, and appropriation of funds, it would take up over 2 years, and perhaps the first one for installation construction and power would be 3 to 4 years.

Mr. MOATS. I would say that from now on, with favorable action all along the line, in just earlier than 5 years we could have power.

Senator GRUENING. Just about 5 years. Well, that's just about the time there will be a shortage here, so it is obvious that speed is desirable, the utmost speed. Colonel Hanburger, from what knowledge there is now, and I grant that it isn't complete, would you like to suggest that perhaps this would be the best interim solution, until such a time as the Rampart Dam comes into being?

Colonel HANBURGER. I believe it would be the best interim solution, sir. I know of no other solution.

Senator GRUENING. The alternative would be a thermal plant.

Colonel HANBURGER. A thermal plant would be entirely feasible, sir, if the power needs are such that a five-year development would be too late.

Senator GRUENING. Have you any estimate as to what the cost of the power at the bus bar would be at the Nenana site?

Colonel HANBURGER. No, sir, I don't, but I believe it would be favorable, and probably be between 6 and 7 mills, roughly.

Mr. MOATS. May I interrupt? As Colonel Hanburger has said, we don't know much about this site, although we have given it a little bit of a look, and I would say this: It will definitely be considerably cheaper than the power being generated in the Fairbanks area, and I think I would like to make it just a little bit greater than Colonel Hanburger has said. I believe that in quoting the figure of 6 or 7 mills he was referring to the final cost when the entire Nenana system is complete. As far as the first increment, the Nenana site, is concerned I would say that it might go as high as 10 mills. But I would like to qualify that, because we know very little of the details that are necessary in order to establish a firm figure.

Senator GRUENING. Well assuming that we proceed full speed ahead with Rampart, and would get that completed in, say, 10 years or 11 years, would the development of the Nenana site be sufficient, or would we have to go into other river sites, such as the Jack River site, and Slagle site? What is your view on that Colonel Hanburger?

Colonel HANBURGER. Sir, I am not prepared to answer that one. Our study will provide for the incremental development of the potentials of the Nenana River. As the other increments are developed, there would be a reduction in the cost of power from the Nenana River. As to the necessity for further development, after an initial site on the Nenana River, assuming that Rampart Dam comes in, this is so far in the future, sir, that I can't state whether the additional sites on the Nenana River would have to be developed or not.

Senator GRUENING. Well from the testimony given here this morning it would seem that the development of the Nenana Jack River site, with a joint continuous output of 25,000 kilowatts would be sufficient to tide over this area until, say 1970, when we hope the Rampart Dam might begin to function.

I would assume that you would not want to proceed with the other sites on the Nenana River unless they were needed. Isn't that a fair assumption?

Colonel HANBURGER. I think that is a fair asumption, sir, and I think that the decisions would have to be made, as the future becomes the present.

Senator GRUENING. I would like to ask one of the other witnesses, either Mr. Haller, or Mr. Canady, how much a thermal plant would cost, and how long it would take to complete that? Assuming that we can't get action more rapidly than now appears to be indicated on the Nenana site, namely, 1965, do you think, Mr. Haller, this area would be satisfied to wait this long or would we be well advised to urge the construction of a thermal plant meanwhile? Will you come forward and talk into the mike?

I am trying to get some estimates as to the best way we can meet this immediate need, or the little less than immediate need which we can foresee in the next 4 or 5 years, indicated by your testimony, Mr. Haller. Now the alternatives are: go ahead with the Nenana site

or establish a thermal plant. I take it if we could avoid the construction of a thermal plant, with its costs, and higher costs of power, that would be desirable. The question is: Can we stretch our needs to 1965, assuming that we can get the Nenana Dam in operation by that time?

Mr. HALLER. Senator, I feel confident that with the cooperation of the GVEA, and the municipal utilities system, and interties, that we can weather the storm until 1965, and avoid the undesirable construction of a plant for producing power by steam.

Senator GRUENING. Well, that would be a very desirable set of circumstances, if they can be achieved. Would you agree with that, Mr. Haller?

Mr. HALLER. Yes, sir; I do.

Senator GRUENING. You agree with that now?

Mr. HALLER. I certainly do.

Senator GRUENING. Are there any dissenting views to that? What do you think, Colonel Hanburger?

Colonel HANBURGER. Sir, my opinion on that is a pure guess. And I would have to accept the figures as given, until I had other evidence.

Senator GRUENING. All right, then, as of now, we would be justified at arriving at the tentative conclusion that we should try and proceed full steam ahead with the Nenana project? That would be the assumption that we would be reasonably entitled to make at the moment.

Now is a representative here from the Fairbanks Chamber of Commerce?

Mr. DON EYINCK. Senator Gruening, I would like to represent the Fairbanks Chamber of Commerce, but we only had about 1 day's notice.

Senator GRUENING. Sit down. Give your name for the record.

STATEMENT OF DON EYINCK, FAIRBANKS CHAMBER OF COMMERCE

Mr. EYINCK. I am Don Eyinck. I am the chairman of the resource and industrial development committee.

We are not as specific in our presentation here, Senator, as some of these others who have preceded me. I would like to say that although I have these notes in a form for an oral presentation, we would like to amplify this with a written presentation as soon as possible.

Senator GRUENING. We will be very glad to have your presentation, and any others. The record will be kept open for several weeks for any additional statements or any additional data that anyone wishes to supply.

Mr. EYINCK. We have one other series of presentations which we think would be useful to this particular hearing, and those are the ones which were made by the Fairbanks Chamber of Commerce on September 5, 1959, to the International Rail and Highway Commission. They set the background and tone which would seem to be appropriate to this particular hearing, also.

First of all, we feel it is essential to consider the total geographic and economic unit. And in so doing we look at the total development

of Alaska, rather than that of individual areas only. We feel that it is important in the present and the future economy to be certain that individual projects fit into place as logical economic parts of a total unit, which show up in their proper time sequence.

Second: we feel it is important to consider the international requirements and the interrelationships of Alaska's needs and those of our neighbors. Right now we have communications, transportation, and economic relations with Canada for transport and communications resources; with Japan in fisheries resources and as a possible source of finished products. Then there is Russia with respect to fisheries and possible resource development.

Someone might say, "We're not actually purchasing anything from the U.S.S.R." But the point is that what they are doing in resource development has an immediate impact on us. An item along that line is, that in the last 3 or 4 weeks they made a fairly large scale sale of oil in the United States, which could be regarded as having an effect in the future, on Alaska, since Alaska is regarded as a coming petroleum source.

Alaska, in the future, must become a part of the Pacific Basin developments. The Pacific Basin has something like 50 percent of the total world's area, and most of it underdeveloped. Now, some people might say this is kind of preposterous. They could say, "Here we're talking about power and Alaska, and you are bringing in international relations." Yet, it seems to me that as in the case of Florida, Texas, and California, which have found it necessary to consider the foreign countries of Cuba, Mexico, and Central America, the point is appropriate. So Alaska must also be concerned with these international things going on around it.

The third major point is that experience seems to have shown here in Alaska that we have rather consistently underestimated our total requirements of all types, and the rate of growth. This, it seems, is chiefly because Alaska does not conform to historical patterns. It is one thing to say that California was settled in a certain way, but it is another thing to say that Alaska in 1960, with our present technological capabilities, is going to be settled in the same way. Alaska will feel this difference—just as the Department of Agriculture has underestimated technological capability in production of agricultural commodities.

This technology is affecting, rapidly, how we can develop here in Alaska, and the particular mode of development. This means, it seems, that the economic framework is drastically different from what it was previously, and technology is almost completely different. This is directly reflected in modes and techniques of transportation and communication. I don't know how the people on your committee arrived in Alaska, but I presume that if they flew up on Pan American, it only took them 3 hours. This is a simple example of change in the past 6 months.

The fourth thing that we would like to mention is that it is possible to regard the development of Alaska as a total unit, because an area or region (for economic and social ties) is linked directly by transportation and communications. The diameter of the region is determined by the time and ease of travel across it.

Here we have this technology coming to bear again. Of course, I know from talking to you a year ago, that you are well aware of

the change in technology which has made transmission of high voltage electric power over long distances economically feasible. Our friends or pseudo-friends, across the Bering Strait, are apparently doing this with the utmost dispatch. So, these changed ground rules give us different yardsticks, which must be used by engineers and economists, at this time, in attacking this problem in Alaska.

The fifth point that we have is—and we feel that this is imperative—that a total resource analysis must be made of all of Alaska. It is not sufficient, merely to bear down, get your microscope out, and analyze Fairbanks or Healy or Windy Canyon or the area around Sutton for a cement plant down near Anchorage or analyze a tin city development up near Nome. Rather, it is important that a total picture be looked at with the same degree of detail, otherwise it is distinctly possible that we will completely overlook some major factors that will pop up and will change things later on. And this seems to have happened in the past. Without this sort of concept, logical and useful plans and forecasts are almost impossible. These are needed for mining and for industrial development, and for working out settlement plans. Now here perhaps we would like to present a view, which might be disagreed with by some people. And that is that rather than having several different entities of the Federal Government analyze each segment of the picture differently, we must develop a well-coordinated and integrated approach to Alaska. After all, it is like having several specialists come and analyze one patient and prepare their reports separately. And the patient looks at them all and says:

"Well, after all, I started out as one individual, whole. You arm specialists are looking at me, and you eye specialists are analyzing me, and you toenail experts have torn me apart. Now who is going to put me back together again? After all, I'm responsible for myself."

Well, it seems as though this is the sort of approach, in many cases, that has been made here in Alaska. We would like to emphasize the fact that now that we have a State government, that the State is the logical agent to centralize and focus attention upon and to perform a great deal of this overall work, so as to centralize this work.

And we would also like to emphasize the fact that we have here, in being, the foundation stone for both research and analysis—the University of Alaska. There is no reason at all why the university should not play a leading role in all of this sort of thing, because it makes economic commonsense. The taxpayers are paying for this, and they should get the maximum possible for their dollar. This fits right in with this concept of polar research and arctic research, which has been presented in the last 2 or 3 weeks, in which the university by using the facilities of the Army and those at Ladd Field, can be the focal point for northern research and development. All these agencies should be coordinated into a unit which might helpfully work on research and industrial development problems in Alaska.

The sixth point we would like to touch on is that it seems essential to consider the several energy sources available in Alaska. It's not just hydropower, but we have the immediate potential of coal and natural gas, as well as atomic power. Now in the past, the pattern in interior Alaska has developed pretty much around coal, simply because this was most economical and it was the most readily available. In the past,

everyone would say, "Hydro is in the future, and maybe natural gas as well. We will find that out about these things in maybe 5 or 10 years." Or maybe, "Atomic power is in the future," but here and now we have a plant going in, of an atomic capability, down at Fort Greely.

We also have natural gas positively known in the Gubik area, and positively known on the Kenai. We have engineers presently making an analysis to see whether or not it is economically feasible to run a pipeline up from Anchorage to Fairbanks, along the railroad. So these things should not be regarded as something that is just hiding in the Dark Ages or lurking in the bushes. They should be flushed out and actively analyzed, so that the ultimate consumer gets the best possible deal in the shortest possible time. What the consumer is after is the lowest cost power, and as quickly and as economically as he can get it. We're not prepared to say which one of these is the best one, though we feel that a competent presentation has been made for hydropower. But we also have members in the chamber of commerce at the present time, in both the petroleum industry and the coal industry in Alaska. They are active people with investments that must be given some degree of consideration at least.

The seventh point that we would like to make is that it would seem to be logical to make maximum use of the studies and ideas which have already been obtained in the last 2 years by the Interagency Power Group. This is a group which is chaired by Mr. Arthur Vieregg in the Department of the Interior. It, to my knowledge, has made two rather comprehensive trips throughout Alaska, and has included top-level people from the Department of Commerce, the Federal Power Commission, the Department of Defense, the Bureau of Reclamation, and the Corps of Engineers. But, at any rate, they have been concerned with the total power needs of the whole State. They have emphasized in the past that it was important to develop the concept of maximum economy at the local level by doing that which is obvious as quickly as possible. And the first thing is to interconnect local power nets or local producers. Once these interconnections are made, one can rely on the other and not necessarily have to build duplicating peaking capacity. Once this is done, then it is essential to look ahead to the possibility of constructing a power grid, not only in central Alaska, but which will connect with the main market of Alaska, in Anchorage, and link the rail-belt area. Now, if this concept is integrated into the total picture, then when a major source comes on the line, such as Rampart or the Wood Canyon project or any other, you have in being something which fits into the total picture, and it would not be necessary to duplicate it.

RAMPART CANYON PROJECT

I would like to comment specifically on the Rampart Canyon project. It seems that there are many possible aspects to the Rampart project which may fully justify its construction other than power production. One thing that we have noted in the past several weeks and months is differences in opinion between several competent people—the Secretary of Interior, Senators, and people here in Alaska—on whether or not it is advisable to go for as large a project as this at this time. But it seems that they have based their consideration chiefly on the power

potential. We would like to point out that it has been emphasized that one of the greatest immediate possibilities for economic development in Alaska is the tourist and recreational potential. We would like to mention that the recreational potential of a lake at Rampart equal in size to or greater than Lake Erie has staggering recreational possibilities. We feel, with boating being what it is in the United States, that it is important to consider this phase. We feel that the fishing potential of this region is something that is almost beyond estimate. If fisheries of Lake Superior or other similar lakes are important, a fishery industry could be created here at Lake Rampart which would be sizable and have a great economic impact, not only on commercial fisheries but to the Indians who might be displaced by the construction of this project. We can foresee the possibility of connecting the highway from Eagle down around the shore of the lake with Circle on the Yukon. This is another point that should be made at this time: That in any future highway planning, the possibility of the development of that lake must be taken into consideration so that it will not arbitrarily flood out several million dollars' worth of construction that has perhaps been put in the wrong spot.

Senator GRUENING. At the present I think there is no great danger of flooding when we have so few miles of highway. But I think the warning is very much in point.

Mr. EYINCK. We feel also that such a large lake in that particular location has strategic military possibilities. For instance, we could envision the possibility, although this hasn't been analyzed in any detail—the possibility of the location of a small, or several small submarines in that lake, which would have a Polaris missile capability. It would seem to me that a mobile launching platform in that spot would be a nice little thing to have in your hip pocket. Another possibility would be to construct an ICBM site, or some sort of defense launching platform in the lake basin and then actually submerge it—bury it with the lake. It would seem to me that this would be almost a totally impregnable defense weapon, or offense weapon.

The thing that has most often, it seems, tripped up different types of projects in Alaska has been those considerations revolving around property ownership and the rights of individuals. It is short-sighted and costly to do the final engineering on a bridge job or a highway job or power job, and then find out that you have property owners to deal with, or a group of property owners, and then the thing stalls for 1 year or 2 years or 5 years. In the case of this dam we would like to point out that we have Rampart Village, Stevens Village, Beaver Village, Venetie Village, Venetie Landing, Fort Yukon, and Circle, as the major villages perhaps having somewhere between 1,500 and 2,500 people living in them, plus other small settlements, scattered along upper Porcupine and along the upper Yukon that will be affected by this development. We would also like to point out that these people are guaranteed aboriginal rights, as stated in the Statehood Act. It is entirely possible that something like this land question could rear its ugly head, as it were, and somewhere along the developmental stages, stall or help to make the project difficult to deal with. So that, in anticipation of these problems, it would seem wisest to go in and try to knock them out, either on a coequal basis, or on a priority basis, along with the engineering analysis. We here in the Fairbanks area have

seen this happen at least three or four times in the last 3 years. Land or right-of-way acquisition problems have stalled the urban renewal project; highway development out at Fox; the Farmers' Loop Road; and it's happening right now on the University Avenue Road. If this happens on a small scale, then certainly when we get to something as large as the Rampart Dam it is entirely possible that something like this could happen on a large scale, too.

I think that is the total scope of the presentation that I have here this morning.

Senator GRUENING. Well, Mr. Eyinck, we are very grateful to you for your very comprehensive statement, and we will be very happy to have you add to it, supplement it in any way that you see fit. The record will be kept open, as we said, for several weeks.

Is Mr. Arnold Hanson here, the representative of the Chatanika Power Co.?

Mr. Hanson, we will be very glad to hear you.

STATEMENT OF ARNOLD HANSON

Mr. HANSON. Senator Gruening, I represent the Chatanika Power Co., a private corporation, which has already developed some hydropower in this area. Of course, I will have to admit that this is not firm power, it's dump power. And in our program for development in the future, we have some hopes of being able to furnish a small amount of firm power, which might help the municipal utilities and the Golden Valley organization bridge this gap between the present and the time that a larger hydro project can be developed. I would like to give you just a brief description of our project, and also a little more detail of what we have planned for the future.

This project was conceived in August of 1958, when we heard that the mining company, working this area, was going to abandon their water supply system, which consisted of many miles of ditch, a diversion dam, and other facilities in the Chatanika Valley. One year after we conceived the idea, we had the plant on the line. Now this included purchasing new equipment for the plant, although we didn't have to do much to the water supply, which is normally the largest part of the development of hydroelectric projects. All we had to do was provide a plant that they could hook onto through an existing inverted syphon which we converted for hydroelectric purposes. We think that that 1-year schedule is some kind of a record in this field. We are at present generating about 2,500 kilowatts in the months from the first of May to the end of October. It is strictly a run-of-the-river plant at present, and if we don't get much rain and the rivers start dropping, our output drops. We are selling this dump power to the Golden Valley system for 10 mills. We would like to build a small storage dam on one of the tributaries of the Chatanika, and it is in the preliminary planning stages. We have two things which will probably determine whether this dam is built. One is, at present, the fish studies that are being performed in the area to determine the habits of the grayling, and to determine whether we would have to put a fish ladder in if the dam is built. If that is necessary we will have to forget all about storage and live with our project as it is, because the

additional cost would rule it out economically. In our thinking on this project, we were gaging our development so it would more or less tie in with future hydroelectric projects, because we realize when they become a fact, that we will either have to live with them or go out of business. So, we are going to try to arrange our development to try to stay in business even though large projects come into the area, and I want to say at this time, that we realize that these large projects are necessary and will do everything on our part to encourage them. We think we can work with them. Another thing that has some bearing on our storage dam is that we are considering the possibility of using an ice core for our dam construction, and thereby work with Mother Nature, instead of against her. This area in the Chatanika Valley is more or less permafrost, which would lend itself to this kind of construction.

Now as far as we know, there has never been a dam built using this idea, but there is one dam at Livengood, which is 70 miles out that has a frozen core, although it is frozen dirt and rocks. I'm not too sure of the composition of the core, but it was frozen artificially. What we propose, or are thinking about, is actually placing the core of the dam in the wintertime, and putting the protection or surface on in the summer.

On listening to the remarks on this Nenana project, it sounds very interesting and the storage at the Nenana project, while somewhat limited, would tie in very well with our project. Our project is run-of-the-river in the summer, and we could take care of some of the load in the summer, allowing the Nenana project to build up their storage in the summer, and thereby take care of the peak periods in the wintertime, because the powerloads in this area, so far, are predominantly winter loads. The summer load has not been developed too much in the summer because of the lack of industry. So that, on any hydroelectric project in this area, it might pay to increase the installed capacity above what you would normally plan in a hydroelectric project, because of this winter load. In other words, where there is normally firm power demand of say 10,000 kilowatts, it is usual to install approximately 15,000 to 20,000 kilowatts. Well, it might pay to consider going above this at least on the smaller projects in the near future, because of the existence of steam plants to carry the summer load, and the big need is for peak power to carry the winter loads.

Further developing this ice core dam idea, there are other sites on the Chatanika that would be adapted for this type of dam, and if it proved feasible on a smaller scale, we are looking into that possibility. In other words, the possibility is that a second project would be a storage project to tie in with our run-of-the-river project. All of our developments, of course, would be tied in with the needs of the Golden Valley and the municipal system requirements.

Senator GRUENING. Mr. Hanson, may I ask you how you propose to finance these various projects of yours?

Mr. HANSON. The present project was financed through individual subscriptions, and we've also obtained a commitment for a $350,000 SBA loan, which is sufficient to finance our present project.

Senator GRUENING. An SBA loan?

Mr. HANSON. Yes.

Senator GRUENING. Well, have you secured it?

Mr. HANSON. We haven't actually secured it yet, but we anticipate the final closing within the next 60 days. We have the commitment.

Senator GRUENING. Do you think that that will be sufficient to take care of the construction that you have in mind?

Mr. HANSON. It will take care of the construction that we have in mind at the present, but unless this ice core idea works out on our storage dam, if it is built, we will need a little additional financing there. Of course, with the present situation on power, the storage isn't too important for another 2 or 3 years.

Senator GRUENING. Thank you very much, Mr. Hanson. We are fortunate in having with us the Commissioner of the Bureau of Reclamation, Mr. Floyd Dominy. Mr. Dominy, would you come forward, please?

STATEMENT OF COMMISSIONER FLOYD E. DOMINY

Mr. DOMINY. Mr. Chairman, I am Mr. Floyd E. Dominy, Bureau of Reclamation. I am very happy to be here representing my agency at these hearings. The Bureau has been working in Alaska since 1948, with special authority from Congress, and we've been devoting our attention almost exclusively to the growing power market needs in the area. We have already built one plant of 30,000 kilowatts at Eklutna. The Cooper Lake project is another that we worked on, and we're happy to see it under construction. It will add another 15,000 kilowatts to the rail-belt area.

The present day economy of the Fairbanks area is based on mining, agriculture, dairy farming, trapping, and tourist industries, and on the military bases in this vicinity. The agricultural industry has shown a steady growth over the years and a great potential exists for renewal and accelerated growth of the mining and metallurgical industries in the future. Electric lines are being extended farther and farther into the agricultural Tanana Valley and to other outlying regions to supply essential electric requirements of the area. Existing power sources barely meet minimum requirements of the expanding market, and the high cost of generation of power and consequent high rates to the ultimate consumer limit the use of many forms of electrical machinery and laborsaving devices which are common in other parts of the country.

This need for more power and at lower cost is recognized by the Bureau of Reclamation and its program of investigations has been concentrated upon projects which will serve the need at substantial reductions in unit cost and with adequate supplies to encourage the establishment and expansion of processing, refining, and fabricating industries to complement the basic resource industries of the area.

The potentialities of the Rampart project on the Yukon River have been known for many years and were considered by the Bureau of Reclamation in the course of its reconnaissance study of water resource problems of Alaska. The report on that study was printed in 1951 as House Document 197, 82d Congress. Based on the findings of that report the Bureau has set up a program of detailed investigations of potential projects designed to parallel the anticipated growth of the power market throughout Alaska and to promote and encourage the industrial, economic, and population growth of the State.

So far as its limited annual appropriations permit, the Bureau has been following that program, and, through it, has completed reports on several potential projects.

It is possible to develop a very large block of hydroelectric power at the Rampart site, probably at generation costs substantially lower than existing sources. However, the Bureau program has been concentrated on projects located closer to the existing and potential power markets, and on projects having power and energy capabilities which can be built by stages to fit the forecast load curves, thereby eventually utilizing the full economic potential of the sites. This program has been effective in identifying and evaluating potential projects, some of which have been adopted and built by local interests. Where the need or opportunity for economic development is apparent and local interests cannot finance the work, we have recommended such projects for Federal Government construction as good investments in the public interest.

Present power generation sources in the rail-belt area—including the market centers of Fairbanks and Anchorage, and intermediate points, and the Kenai Peninsula—have managed to meet market needs to date, other than military, with less than 100,000 kilowatts of installed capacity. The capability of the Rampart site has been estimated as high as 5 million kilowatts, which, of course, would be far in excess of present or near future market requirements under any normal load growth forecast. Consumption of so large a block of power can be expected only when power-consuming industries are established in the area on a large scale, which does not appear to be in prospect at this time.

The Bureau of Reclamation has investigated the potentialities of the Susitna River Basin generally and of the Devil Canyon project in particular. A feasibility report on this project is now in final stages of preparation. It will propose a more modest program than the Rampart project to meet the rail belt's needs for years to come.

The Devil Canyon site is situated about midway between Fairbanks and Anchorage. The project would consist of two dams and reservoirs, a powerplant, and necessary transmission facilities to deliver the power to the market centers and to intertie existing generation facilities and loads. Ultimately, this project would have an installed capacity of 580,000 kilowatts, but the plan lends itself to multistage development so that construction of facilities and installation of power capability can keep ahead of growing requirements. With power and energy being sold at substantially less than existing rates, the Government's investment in this project could be repaid with interest within 50 years.

When the power market absorbs the output of the Devil Canyon project, additional hydroelectric developments in that area can be ready to take up the load. Two other promising sites on Susitna River, Vee Canyon, and Watana, the Chakachamna project some 80 miles west of Anchorage, and the Wood Canyon project on Copper River, are on the Bureau of Reclamation investigation program. These, collectively, could add 2 million kilowatts to the area power supply.

I might add Mr. Chairman, that the Devil Canyon project has been investigated. The drilling has been completed. We have the necessary detailed engineering data to come up with a firm design and cost

estimates on the Devil Canyon site. We also have studied, planned, and estimated the cost on the Denali site which would supply the reservoir for storage. The plan visualizes approximately a $70 million transmission facility, which would interconnect systems serving the entire rail-belt area. If Devil Canyon project were to be built first, of course, advantages to the rail-belt area from the interconnection would be immediately realized. Cooper Lake and those other projects, such as the Chakachamna and the Bradley Lake projects, would then be of value, not only to the Anchorage area, but to the entire rail-belt area. We don't have firm estimates on the kilowatt-hour energy cost, delivered to the cities, so it could be incorporated into their distributions systems. We know from our preliminary analysis that it will be less than 8 mills. We are hopeful that the further design and engineering work which is now being undertaken, in finalization of that report, will reduce it even below that figure.

Senator GRUENING. What do you estimate the cost per kilowatt-hour would be at the bus bar?

Mr. DOMINY. Approximately 6 mills, at the bus bar at Devil Canyon.

Senator GRUENING. And what would the cost of the total project be?

Mr. DOMINY. Including the transmission system, it would run around $490 million. Our final cost estimates may reduce that somewhat now that more engineering and cost data has been gathered, including the work that has been done this summer and is now available to our designers and estimators.

Senator GRUENING. You say "including a transmission system." Do you mean a transmission system to Fairbanks and Anchorage?

Mr. DOMINY. Yes; that would be the entire grid costing about $70 million for the transmission system.

Senator GRUENING. The transmission system would cost about $70 million, in your judgment? And so the cost of the project itself would be approximately $490 million?

Mr. DOMINY. Roughly of that order, yes.

Senator GRUENING. And you are prepared to go ahead and ask authorization of Congress?

Mr. DOMINY. Well, this, of course, depends on the results of reviews of the report, together with the interest displayed by the State of Alaska.

Senator GRUENING. Assuming that this project were ready for authorization, and the appropriation was secured in the 87th Congress, how long do you think it would take before this project could be put in?

Mr. DOMINY. The transmission grid, and the two dams and powerplant could be completed in a construction period of about 7 years.

Senator GRUENING. Would you be kind enough to submit for the record, as completely as you have, all the data on this project?

Mr. DOMINY. Yes, sir, we can give you information that is still somewhat of a preliminary nature, because we are currently, based on the engineering data accumulated this summer, arriving at the final estimates which will be incorporated in our report. We hope to have that report completed so that the people of Alaska can review it, and if interest is displayed, it could be presented to the next session of Congress.

Senator GRUENING. What would the storage capacity be of the Devil Canyon project?

Mr. DOMINY. I would have to ask Daryl Roberts to give you that specific answer, sir.

Mr. ROBERTS. It would be in the neighborhood of 5 million acre-feet, sir.

Senator GRUENING. I think that is all. Thank you very much, Mr. Dominy.

I think the Corps of Engineers has an additional statement to make on Rampart.

FURTHER STATEMENT OF COLONEL HANBURGER ON RAMPART DAM

Colonel HANBURGER. Senator Gruening, I am Colonel Hanburger, again, with a few remarks on the Rampart Dam project.

The Flood Control Act of 1948, as amended by the Flood Control Act of 1950, directed that a study of harbors and rivers of Alaska with a view to determining the advisability of improvements in the interests of navigation, flood control, hydroelectric power and allied purposes shall be continued under the jurisdiction of and shall be prosecuted by the Army under the direction of the Secretary of the Army and the supervision of the Corps of Engineers. This directive resulted in the preparation of a series of seven interim reports covering the entire State of Alaska. The Corps of Engineers has submitted six of these reports and they have now been published. The seventh and last report is now virtually complete and covers the Yukon and Kuskokwim River Basins, in which the Rampart Canyon project is located. In preparation of these seven reports, $1,171,000 was expended. This included a complete analysis of the hydroelectric potential of Alaska, which comprised 169 sites having a total potential installed capacity of about 19 million kilowatts. Also included were investigations for needed navigation and flood control works. A total of $22,479,000 has been authorized by Congress for construction of projects recommended in the six completed interim reports.

During the early stages of the investigation leading to Interim Report No. 7, covering the Yukon and Kuskokwim River Basins, it was apparent that the Rampart Canyon project had the greatest potential power output of any hydroelectric project in the United States. Last year Senator Gruening introduced a resolution in the Senate Public Works Committee requesting a full-scale report on the hydroelectric capability of Rampart project. On April 24, 1959, the committee directed the corps to make a study.

This study was initiated last year and I would now like to briefly outline the project. I do wish to make it clear that our present information has been developed largely from map study and use of existing precipitation and streamflow records compiled while preparing Interim Report No. 7. We had a team of geologists make a field reconnaissance of the site last fall as a start on the more detailed report now underway.

POWER CAPACITY OF 4,760,000 KILOWATTS

There are many possible damsites in the general area. One site which appears most favorable has a width of about 1,400 feet at present

water level. A concrete gravity dam 500 feet high with a crest length of approximately 2,900 feet is now proposed. This dam would develop a usable head of 440 feet and would control the annual discharge of Yukon River to a uniform release of 118,000 cubic feet per second. This flow, combined with the 440-foot head, warrants a power installation having a total capacity of 4,760,000 kilowatts. This dam, with a concrete volume of approximately three-fourths that of Grand Coulee Dam, would have an installed hydroelectric capacity of 2½ times that currently in operation in Grand Coulee.

The area and capacity of the reservoir are also interesting. The reservoir would have surface area of about 10,700 square miles, an area slightly larger than that of Lake Erie. The storage volume would be 1,300 million acre-feet. Enough water, if it were distributed evenly, to cover the land area of all of Alaska to a depth of 3½ feet or all of Texas to 7½ feet. Because of the tremendous volume of storage, it is anticipated that the seasonal drawdown will be less than 4 feet, thereby allowing the generating units to operate at peak efficiency throughout the year. Experience in Scandinavian countries and in Russia indicates that Rampart Canyon power could be transmitted economically to tidewater load centers by means of extra high voltage lines. The power grid would, of course, serve Fairbanks and other interior areas with the more conventional transmission lines.

COOPERATION WITH FISH AND WILDLIFE

In fiscal year 1960, Congress provided $49,000 to initiate the detailed studies. The major portion of this money has been utilized in preparing maps of the damsite and reservoir area, for geological reconnaissance of the site, and in preparing plans for detailed foundation explorations. Our geologists have spent considerable time in both the field and office in evaluating the site and planning a proper drilling program. In addition, funds were allotted to the U.S. Fish and Wildlife Service to initiate their studies as described by the Fish and Wildlife Coordination Act. This is a brief summary of our activities. I would like to take a few more minutes to outline our tentative schedule of investigations.

Although Rampart Dam would earn minor benefits from navigation and downstream flood control, the major portion of benefits would accrue from the sale of low-cost hydroelectric power. I believe we all recognize the problem of selling such a large block of power under present conditions. For this reason, this year we will undertake an exhaustive economic study of Alaska's potential resources and its future power requirements. It is estimated that 2 years will be required to complete this phase of the investigation.

POWER COSTS 2 TO 3 MILLS PER KILOWATT-HOUR

To give you some idea of the costs involved, a preliminary estimate, based on the reconnaissance-type data we now have, is that Rampart project would cost in the neighborhood of $1⅓ billion. This is a lot of dollars, but when reduced to cost per kilowatt-hour, results in a power cost of 2 mills at site, substantially less than any other new power project in the United States. Based on new improved trans-

mission lines and methods, tidewater cost might be approximately 3 mills.

Low-cost power has always attracted industry, even when raw materials have to be imported. The Kitimat project in Canada is a good example. All material for the manufacture of aluminum is brought to that source of low-cost power. The aluminum plants along the Columbia River are other examples. Three-mill power costs at tidewater are comparable to the most favorable projects anywhere in the world.

In addition to the economic survey, a complete hydrologic study of streamflow, climatic conditions, siltation and other similar data is necessary to determine the proper size and capacity for various features of the dam itself. This study will also be initiated during the coming year. As I previously indicated, some foundation studies will also be made.

CONSTRUCTION PERIOD OF 8 YEARS, POWER IN 6 YEARS

Although subject to change as additional studies are completed, we now estimate that 8 years will be required to construct the dam and powerhouse. At the end of this period all main features would be complete, and the only remaining work would be the installation of additional turbines and generating equipment. Our period for filling the reservoir is based on storing three-quarters of the runoff and passing the remaining one-quarter. With the streamflow data now available it appears that 20 years will be required to completely fill the reservoir. We also estimate that power would be generated from the initial units within 6 years after initiation of construction. These units would be operating at a reduced head and naturally not at the peak efficiency that will ultimately be realized at the full power head of 440 feet. I again wish to state that these figures are very preliminary and may be subject to considerable change as more detailed studies are completed.

We must also recognize many unique engineering problems connected with this study. The turbines and generating units are larger than any now manufactured. The effect of extreme cold on a project of this type is largely unknown. We will be studying the experience and research of other nations as well as that of the United States to find a satisfactory solution to these problems. In addition to these studies by the corps, additional funds will be allocated to the U.S. Fish and Wildlife Service for continuation of their portion of the report.

PROTECTION FOR FISH RUNS

Perhaps the most serious problem in the fish and wildlife field is that of the anadromous fish runs. As you probably know, the corps and U.S. Fish and Wildlife Service have been working together on this problem for years. Considering the advancement that has been made in design and with continued research, I believe the problem of passing fish upstream will not be particularly difficult; I am also optomistic that satisfactory methods for the passage of downstream migrants will be developed by such time as Rampart Dam may be constructed.

Other problems are the inundation of waterfowl nesting grounds and the migration routes of big game animals as well as the relocation for persons now residing within the reservoir area. All of these problems are to be considered within the next few years as the report on Rampart Dam and Reservoir is prepared.

Finally, there have been proposed several projects which would involve diversion of the headwaters of the Yukon River to tidewater for power generation. These projects will require the cooperation of our Canadian neighbors, and my office is in no position to evaluate the probability of their construction at this time. However, in the preparation of our Rampart project report, we will consider all of the proposed diversions which appear feasible and evaluate their effect upon the Rampart project.

Senator GRUENING. Thank you very much, Colonel Hanburger, for this very comprehensive statement on Rampart. As you know, the last Congress raised the amount provided in the budget, which was $100,000 to $225,000, so that to date you have approximately $273,750. And we are hopeful that we can get you, in the next Congress, the necessary amount that is required. I understand that the total amount that is estimated for the completion of these studies is in the neighborhood of a million dollars. Would you say that is correct?

Colonel HANBURGER. Yes, sir; that is correct.

Senator GRUENING. Well, we are hopeful that the Congress will act with generosity and speed on this subject, due to the importance of the project.

Our next witness is Mr. Ivan Bloch. We are very happy to hear Mr. Bloch, who is an expert in this power field because of vast experience in it.

STATEMENT OF IVAN BLOCH

Mr. BLOCH. Senator Gruening, my name is Ivan Bloch. I am an industrial consultant, having specialized in heavy-power-using industries during the past 20 years. From 1938 to 1947, I was chief of the division of industrial and resources development of the U.S. Bonneville Power Administration in the Pacific Northwest. I was also a special consultant to the Secretary of the Interior on the industrial development of the West and Alaska. In 1947, I opened private consulting practice in Portland, Oreg., and continued to serve the Department of the Interior, the Corps of Engineers, and the Governor of the State of Oregon in the field of industrial development. I was also retained for the same purposes in the Philippines, Jamaica, West Indies, and Chile, South America. My private clients have included a number of industrial concerns particularly interested in heavy-power-using industries. I am now a consultant to a new aluminum industry proposing to build an aluminum reduction plant at Longview, Wash.

In summary, during the past 20 years I have assisted in the analysis and location of eight major aluminum plants, three ferroalloy plants, two calcium carbide plants, one chlorine plant, one abrasives plant, and various others.

Before expressing my considered views regarding the urgent need to develop Alaska's power resources, I would like to define the cate-

gory of industry which I believe will seek location in Alaska, and the kind of power which will be required to make the location of these industries economically feasible.

The electroprocess industries are those in which electric power is a raw material ingredient as contrasted to that which is used in other industries merely to turn wheels. In this category of industry are those producing aluminum, magnesium, titanium, zirconium, hafinium, electric steel, electric pig iron, electrolytic copper, zinc and nickel, ferroalloys, chlorine and causic soda, calcium carbide, elemental phosphorus, artificial abrasives, and many others. These are the industries whose products are virtually basic to the maintenance and progress of modern civilization, and to its defense.

The products of these industries cannot be made except by means of the electric furnace and the electrolytic cell. The amounts of electric power utilized per pound or ton of product are enormous. One ton of aluminum requires in excess of 15,000 kilowatt-hours. One ton of elemental phosphorus consumes 13,000 kilowatt-hours, and so on. Minimum-sized production plants must therefore be supplied with large blocks of power. For instance, a minimum-sized aluminum plant for 20,000 short tons of metal per year requires on the order of 45,000 kilowatts, and will consume in excess of 300 million kilowatt-hours per year.

Because of the process characteristics of these industries, power supplies for electroprocess industries must be continuous; that is, it must be firm.

At this point, therefore, I wish to stress an important ruling consideration. Power supplies for electroprocess industries must be of the lowest price. In the Pacific Northewst, the average price of power to the very large aluminum industry located there has been slightly under 2 mills per kilowatt-hour. It should be pointed out, however, that in the Ohio Valley aluminum plants have been established relying on large mine-mouth, coal-fired generating plants producing power at between 4 and 5 mills per kilowatt-hour. The reason such high cost power can be used by these aluminum and other electroprocess plants is that this location is in the midst of the major consuming markets for the end products. Stating this in other words, the economic feasibility of electroprocess plants depends on a balancing of power and transportation costs. A plant in the center of markets can afford a somewhat higher price for power. A plant distant from major markets can operate economically only with the lowest cost power.

With reference, therefore, to the ultimate location of major electroprocess industries in Alaska, it will be necessary to consider only those hydroelectric projects which can provide large blocks of continuous power at tidewater for not more than 2 to 4 mills per kilowatt-hour. The upper range of 4 mills, in my considered judgment, however, would only be valid probably 15 to 20 years hence when whatever remaining hydro in the rest of the United States has been fully committed as to markets. I base this estimate on analysis I have made, and to which I will refer later in this statement, regarding the supplies of power which will be available in the rest of the United States for the next 20 to 40 years.

In terms of information available at this time on the characteristics of Alaska hydroresources, it is my opinion only a few projects can

be considered to qualify for potential major Alaskan electroprocess industry establishment. These are, in apparent order, the Taiya project near Skagway-Haines; the Rampart project on the Yukon; Wood Canyon project on the Copper; and possibly Bradley Lake for some limited electroprocess operations. I do not rule out the potentials of other hydro which future engineering studies may reveal as feasible in terms of their ability to produce power in large blocks within the delivered price range I have indicated. Nor do I rule out the eventual large-scale utilization of coal or natural gas, provided the costs fit the pattern.

At this time, it appears to me of critical and urgent importance to define potential electroprocess power markets. Obviously, the large hydroplants, outside of Bradley Lake to which I have referred, can only be built if there is reasonable likelihood that their output can be absorbed. By the same token, however, we cannot talk about specific markets until and unless full-scale inevstigations of potential sites have been made.

POWER REQUIREMENTS OF ELECTROPROCESS INDUSTRIES

During recent years I have made numerous studies of the power requirements of national electroprocess industries. Within the past few months I have completed some preliminary estimates for as far in the future as the period 1980–85, and even to the year 2000, which is only 40 years away. At this time I should like to introduce for the record the preliminary results of my studies for a few major electroprocess industries. This does not purport to be a complete list but it is indicative of what my professional analysis reveals. (See the following tabulation.)

Forecasts of future production and power requirements for 1985 for electroprocess industries

Industry	Short tons (thousands)	Power (megawatts)	Industry	Short tons (thousands)	Power (megawatts)
1. Aluminum metal	16,000	27,200	8. Ferroalloys	3,500	2,870
2. Magnesium metal	570	1,080	9. Elemental phosphorus	1,300	1,950
3. Titanium metal	150	660	10. Chlorine and caustic	16,000	580
4. Zirconium metal	130	570	11. Calcium carbide	2,300	920
5. Electrolytic copper	1,620	210	12. Fused alumina	210	129
6. Electrolytic zinc	840	395	13. Silicon carbide	430	210
7. Electric steel	38,000	3,800			

From this tabulation of both production and consequent power requirements for these electroprocess industries by the year 1985, the aluminum industry by far is the largest. My estimates are supported by estimates of the Aluminum Co. of America, Reynolds Metals Co., Kaiser Aluminum & Chemical Co., Ormet (Olin Mathieson and Revere), and by the Ford Foundation supported research corporation, Resources for the Future. With regard to Resources for the Future, this agency's findings were made part of the record of the Select Committee on National Water Resources, U.S. Senate, 86th Congress, 2d session in its report, "Future Water Requirements of Principal Water Using Industries," Committee Print No. 8, April

1960, page 79. By 1985, it is apparent that the U.S. aluminum industry will produce around 16 million tons of metal, or approximately 5 times present U.S. production capacity. This reflects the amazing average rate of annual growth of 13 percent which has taken place during the past 20 years, but which I have considered as slackening off somewhat in future years.

LOW-COST ALASKA POWER WILL BE NEEDED

Taking U.S. aluminum requirements alone, the 16 million tons of capacity by 1985 will necessitate providing around 27 million kilowatts of firm power at lower cost. To what extent can Alaska provide some of these power requirements? The answer will be found in the analysis of where else power supplies of the essential characteristics defined will be found. In very brief summary, I believe it is fair to state that, by the 1980's, we will be scraping the bottom of the national hydropower barrel with the exception possibly of the Pacific Northwest and certainly of Alaska.

Generally, the outlook for electroprocess industry power supplies as I visualize it during the next two decades or so is as follows:

Some expansion will take place in the Pacific Northwest although a great deal will depend on the policies which will control the further development of the Columbia and its tributaries, including the Canadian portion of that river system. With regard to the construction of very large mine-mouth, coal-fired steam electric plants in the Ohio Valley and adjacent areas, the basic question is whether or not sufficiently large, very low-cost coal mining properties are available to sustain the operations of many more such large steam-electric plants. I believe that the potential expansion there is somewhat limited. The next possible area for electroprocess industry development would be adjacent to the vast Rocky Mountain coal region based on the use of these coals in very large mine-mouth steam electric generating plants. However, the transportation costs to markets from this inland area, removed from tidewater or large navigable river systems, will place a restriction on the economic feasibility of locating large electroprocess plants. As to nuclear power, the present outlook is very much clouded and uncertain as to whether it will take two or several decades before techniques are sufficiently advanced to provide power of such low-cost levels as to make them attractive or even economically feasible for electroprocessing.

Thus, at this juncture, using aluminum as a prime illustration, my opinion is that another 2 or 3 million kilowatts can probably be developed in the Ohio and adjacent areas, another 3 or even 4 millions may become available in the Columbia River system, with the remaining 14 million kilowatts of requirements to be sought in Alaska and in the Rocky Mountain coal area. Mind you, this only refers to aluminum, and does not consider the requirements for other electroprocess industries.

ALUMINUM INDUSTRY SEEKS HYDROPOWER

It must be realized that the aluminum industry has always sought hydroareas in preference to others, and especially in underdeveloped areas in which competition for sources of power supplies are either absent or very small. Thus we find plants as isolated as that at

Kitimat in British Columbia, to which the basic raw materials are shipped by water from the Caribbean area, and the finished pig aluminum transported long distances to consuming markets. The exceptions of plants in the gulf coast and Ohio Valley have been forced by short-term power considerations rather than by long-term preference. With regard to the very great activity of the U.S. aluminum industry in seeking foreign hydropower locations, attractive as some of the possibilities may appear physically, the ancillary political and economic turmoil taking place in such areas as the Congo obviously place a serious question mark on such potential sources in terms of U.S. demands, not to mention national security.

I might also add that the growth of aluminum consumption in other parts of the world is so enormous, that as one contemplates these total markets, whether they be in the Far East, or the Middle East, or even in Europe, those potential hydrosites, such as the Volta in Ghana, the Fria project and others in Africa, and possibly some of the projects of southern Chile, are likely to be required to meet those markets, leaving open the question of where our own requirements will be met.

Therefore, it is my present opinion that a major portion of electroprocess industry expansion could and should take place in Alaska at such as Taiva, and in tidewater areas which could be fed by such as Rampart. The development of these great projects should be commenced at the very earliest possible moment, not merely because they represent a tremendously important resource for the economic development and stability of the new State, but because there is urgent national and security need for the power output. In view of the magnitude of the undertakings, the breadth of engineering investigations required, and of negotiations which will be necessary with our Canadian neighbors, time is of the essence.

If I may, Senator Gruening, I would just like to point to one or two other items, which I did not include in my formal statement.

I think that all of us who have been acquainted with Alaskan development over the past 20 years have always tried to forecast just exactly where development may take place, and in what manner. We've talked, and I've certainly been as guilty of that as anyone else, of these vast untapped natural resources, but the definition of them is a bit difficult with the exception of hydro and two or three other very large mineral substances. It is my understanding that the summary conclusions of the Battelle Memorial Institute, in its work for the International Rail and Highway Commission, will stress one fact in particular. And that is that the development of large mineral base industries in Alaska will be possible only when large sources of low-cost electric energy are made available. Many of our resources, of which something is known, are of such, shall we say, low grade, that as they stand they are of little economic interest. But combined with large sources of hydroelectric power, or other low-cost power, their development becomes feasible. One such possible project involves the Klukwan iron ore deposits, which I think will lay dormant until and unless large power resources at low cost are made available to that particular area.

So we have, in effect, a twin-pronged approach. One in which national requirements and world requirements by reflection will necessitate power from such as Rampart. And the other is that our own

resources will lie dormant until power is available at low cost, and in very large blocks.

I think again that time is urgent. Both in terms of the welfare of the State, from its economic development, and certainly in terms of the overall national welfare and security.

OBSTACLES TO TAIYA VALLEY DEVELOPMENT

Senator GRUENING. Thank you very much, Mr. Bloch. I would like to ask you one or two questions. You give Taiya high priority in projects, and I think you all know of its potential values, but you realize that the Canadian authorities refused to go along, several years ago when the Aluminum Co. of America was prepared to build a large plant in the Taiya Valley, and to create a city of 10,000 people, and to bring bauxite from outside. Everything was ready to go. The only thing that was lacking was the consent of the Canadian authorities, which was indispensable. Have you any reason to believe that the Canadians have changed their minds? And will they let us have some of this waterpower on our side of the boundary?

Mr. BLOCH. Well, you know Senator, tempus fugit, and things change. And I believe again that the total pressures of electro-process industries, including the Canadians is such that the time may be right for renewed considerations of such as Taiya. It has a great many attractive features which I think even the Canadians recognize. But I believe it is one of those plants, and I hate to use this expression in Fairbanks, that will break the ice so to speak. And this business of breaking the ice is awfully important.

If I may digress for a minute: When I first arrived in the Pacific Northwest, Bonneville Dam had two large generators grinding out some 86,000 kilowatts, with a total market of 1,500 kilowatts which was used to run a merry-go-round at Cascade Locks. There seemed to be no possibility of intriguing industry to make use of that power because of such inhibitions, or at least apparent inhibitions, as a somewhat uncertain labor situation, the fact that in the minds of eastern capital, the Pacific Northwest was a land of the Indian and buffalo, that the amenities of civilization were not present. Then Alcoa decided to move in. From there on the job was easy.

MISAPPREHENSION ABOUT ALASKA

I believe there exists still, in both financial and industrial quarters, a great deal of misapprehension about Alaska, some of which I will grant is justified. But once somebody makes the first step, the second, third, and each succeeding step would come very simply, or very easily. I am not saying that Taiya is necessarily the project that would bring that about, but I think it has a good chance, what with the industry of the ferrous metals as well as the nonferrous metals industry. That is about all I can say at this time on Taiya.

That doesn't mean, and I would like to stress this again, that Rampart shouldn't go full steam ahead. I think that even though Taiya is a beautiful project, the very fact that it is beautiful will create such a demand, and immediate demand, that its output will be immediately sopped up at a very rapid rate. This has been the ex-

perience throughout the world whenever a good power project has been developed, or even at the stages of its inception, its output is committed most rapidly.

The Bonneville Power Administration in June of this year, after a long period of hesitation, announced that it would have available for sale, 150,000 kilowatts of prime power, or firm power, and a very large amount of secondary power. It provided a cutoff date for applications. In other words, the time was terminated after about a month. For this little measly block (and I say it was a measly block of 150,000 kilowatts), there were inquiries of roughly three times that amount on a firm basis or actual applications, within 1 month. And the total inquiries amounted to well over 1 million kilowatts. Three inquiries were for phosphorus production in western Montana. One inquiry was for a very large chlorine and caustic plant. Three inquiries and two formal applications were made for aluminum. A new plant will be constructed using the very low grade copper slags of Anaconda, by Webb and Knapp, using electric power, by a new process. So the demand is there. There is no likelihood, in my opinion as I have said, and I have studied this subject for many, many years, that given the development, or even the beginning stages of large projects, such as Rampart and Taiya, that the market situation will not take care of itself.

SAME ARGUMENTS AGAINST BONNEVILLE AND COULEE

I know that the same argument was made against Bonneville and Grand Coulee, that no power would ever be used from those projects. Well, you know as well as I do, Senator, that there has been a shortage situation ever since in the Pacific Northwest. And every new kilowatt, decent kilowatt will be sopped up almost instantly. I believe this situation will continue for many years.

Senator GRUENING. In your estimate of potential power uses in your supplement, on future production power requirements, have you considered the possibility of nitrogen fixation? And the use of the very vast phosphate rock deposits in the Brooks Range for fertilizer?

Mr. BLOCH. Well, let me say this, that because of the very nature of the study for which I was retained at the time, I did not have the time to go into nitrogen fixation and the use of the alleged phosphate rock deposits in the Brooks Range, or production of synthetic ammonia. With regard to phosphate resources, one of the principal elements of my inquiry was in regard to the southeastern Idaho phosphatic resource, which is enormous. I'm not acquainted sufficiently with the phosphoria formations in Alaska, which would be susceptible to electroprocess treatment, but I will say this, that if those raw materials, which are generally considered low grade in the phosphate fertilizer field or general phosphate industry approach are of the magnitude indicated, then the electric furnace does offer the means, providing the price is right, of making usable material. The phosphorus industry is growing, both in terms of its needs for chemicals, gasoline additives, detergents, and plastics. But its big and not altogether tapped possibilities are in the field of highly concentrated phosphatic fertilizers, for which there is a growing world demand. And with increased population, of course, the demand compounds itself.

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Should Alaska possess sufficient reserves of this material, I think it would have strategic importance with regard to, at least, markets in the Far East—in Japan, Korea, and adjacent areas. With regard to elemental phosphorus, I have studied that, and the curve is another one of those which has continued to go up in spite of predictions to the effect that it would not.

Senator GRUENING. From your experience, can you tell us anything, or suggest anything, in regard to what you think the participation of the State should be in this hydro development? What is the situation in Washington and in Oregon in connection with their Federal projects? Did the State move into the picture at all, and play an important part in the use of the power afterward?

Mr. BLOCH. Well, historically, both States have been interested in the development of their power resources, because it was a tangible resource of the States to begin with. Actually, however, it took the Federal Government to provide the catalytic action, as well as the money, to get the projects started and underway. I think that if it had not been, in effect, for the Bonneville Power Administration and its very vigorous program of industrial development—and I say this quite immodestly, I'll admit—I think that the development might have been at a somewhat slower rate. It was necessary for us to convince the industrial community that there were profits in "them there" hydro resources. But, once the facts were presented, together with the logistics of the situation—and the economics—it became a very easy job. The States participated in that phase of it, through their departments of planning and the departments of development, so that we had, in effect, for a number of years a regional concept of development where State lines did not matter. However, that situation does not prevail at this moment. The States have individual programs, the Federal Government fundamentally has none. And I believe the rate of development has consequently slowed down. Now with regard to specific development of power facilities, the State of Washington is further ahead, in many ways, than the State of Oregon. The State of Oregon is known to be fundamentally conservative. The State of Washington is perhaps more progressive. The State of Washington established a power commission, at one time with fairly wide powers, which it has never exercised.

Senator GRUENING. Well, there is a somewhat different situation here in Alaska, because of our larger area, and presumably that all this power would be developed and used within the State, and it would seem to me that the State should have a substantial part in the planning, both the consequences of this power development, such as is the case of Rampart, where there will be the dislocation and relocation of some civilian population, and other aspects with which the State will be very much concerned, and then with the promotion of the use of this power once it is generated. And if you have any ideas on this subject, I would be very glad to have you submit them ready for the record, and I'm going to ask Mr. Eyinck to do the same thing. Because I think that here the State has a function which it should consider very seriously, and perhaps exercise as the facts warrant.

Mr. BLOCH. Well, Senator, I would like to agree with you completely. I think that the State has probably one of the most outstanding opportunities of any State, in that it starts with a clean white sheet of paper, so to speak.

DEVELOPMENT ALTERNATIVES

I will go so far as to state that the manner in which the power resources of Alaska are developed, and the manner in which they can be utilized by local entities, is going to make a difference between tangible economic results, or chaos. The State is in a position to benefit by the profitable errors made by other States. And in so doing, it seems to me that the State needs to appraise the power situation from a technical point of view, technical and economic point of view, at first trying to define objectives, trying to establish the nature of the problems that will be faced. Coming up with alternatives, administrative and other mechanisms, that will fit the technological and economic problems is another step. This leaves, shall we say, some of the other aspects, political and otherwise, to fit into the technical phase of the program.

For example, not merely the matter of building powerplants, but the whole problem of integrating these powerplants by means of a power transmission network is a technical problem. It necessitates the employment of new ideas, new devices, all directed at one thing—lowering of costs.

We just can't rest content with the very fine work that has been done elswhere, in high voltage transmission. We have to develop some new ideas and new concepts. And, in this, I think the State can play a very great part. The manner in which marketing policies are developed should also be based on the facts instead of on, perhaps, prejudices, which always come into the picture. So it seems to me that in the agencies of State which are established, there is a start. I refer more particularly to the State power commission, which is supposed to come up with some ideas for the next legislature. The most important task which faces us is to develop a competent analysis of objectives and problems, at the technical and economic level and letting the rest follow.

Senator GRUENING. Thank you very much, Mr. Bloch.

Mr. Retherford, would you like to testify?

Mr. RETHERFORD. Yes, I would.

Senator GRUENING. We would be very happy to have you do so.

STATEMENT OF ROBERT W. RETHERFORD

Mr. RETHERFORD. It just happens that on the chance that I might be able to testify, I have brought some written material along with me.

My name is Robert W. Retherford, consulting engineer, with my office in Anchorage, Alaska.

I have been associated with electrical distribution and transmission projects since 1937, and since 1950 in Alaska with electrical systems involving distribution, transmission, and generation by diesel, hydro, and steam. I am presently engineering consultant for—

Chugach Electric Association, Inc., Anchorage, Alaska.
Golden Valley Electric Association, Inc., Fairbanks, Alaska.
Homer Electric Association, Inc., Homer, Alaska.
Kodiak Electric Association, Inc., Kodiak, Alaska.
Kotzebue Electric Association, Inc., Kotzebue, Alaska.
Naknek Electric Association, Inc., Naknek, Alaska.
Dillingham Public Utilities District, Dillingham, Alaska.
City of Seward, Seward, Alaska.

My other work in Alaska has included engineering for—

Matanuska Electric Association, Inc., Palmer, Alaska.
Copper Valley Electric Association, Inc., Glenallen, Alaska.
Glacier Highway Electric Association, Inc., Auke Bay, Alaska.
City of Nome, Nome, Alaska.
Cordova Public Utilities, Cordova, Alaska.
Seldovia Light & Power, Seldovia, Alaska.
John Slagle Electric Power Co., Nenana, Alaska.
Floyd Miller Enterprises, Northway, Alaska.

This experience encompasses private, municipal, and cooperative electric systems. My work with all these systems has been generally aimed at solving the need for more and lower cost electric power. Many communities of Alaska are physically isolated from other communities by considerable space of roadless, relatively uninhabited wilderness. This creates a considerable obstacle in the path toward adequate, low-cost electric power supply. Individual electric plants of small size serve most of these communities at relatively high cost.

TRANSMISSION PROGRAM VITAL

The possibilities of interconnection by transmission lines to areas of lower cost energy seem remote, yet there appear to be some interesting possibilities in theory—but little in practice—by which to judge more accurately. These possibilities include single-wire, long-span, low-cost transmission lines of high-voltage d.c. or single-phase a.c. with conversion to more useful three-phase power at the load centers. Other arrangements more complex and for higher power levels have been studied and experimented with in other parts of the world, but little has been accomplished in the United States. Alaska's great distances and small electric loads make its problems a real challenge to engineering. Low-cost electric energy for these smaller widespread communities will depend largely on solving the transmission problem.

The larger communities in the Cook Inlet-Railbelt area including Homer, Seward, Anchorage, Palmer, and Fairbanks have better power supplies at somewhat lower cost but still relatively high by most standards. Load growth is gaining rapidly on generating capacity and new sources of power must be developed.

Transmission lines are under construction to interconnect the Palmer, Anchorage, Seward, Homer areas. A minimum transmission line to Fairbanks along the Alaska Railroad route would provide power supply and interconnection at several points along the way and could deliver sufficient useful power to Fairbanks to provide some improvement in power costs. But primarily it would serve to expose more area to central station service and provide a circuit for connection of additional small hydro or mine-mouth thermal generating plants along the way. The availability of such a transmission feeder would stimulate the growth of existing electric loads and open up to new consideration projects along the way now hampered by lack of power. This feeder-type transmission line could take, later, a place as a subtransmission circuit when larger high-voltage, high-capacity lines are built to take power from projects such as Rampart. I believe that careful investigation would show that a line of 115,000 volts along the 350-mile route between Anchorage and Fairbanks (although

posing several technical problems) could transmit about 20,000 kilowatts satisfactorily and would encourage development of additional small, low-cost hydroprojects and possibly mine-mouth steam generation which would increase the total power available through the line to meet load growth.

AREA REQUIRES NEW GENERATION STARTS

Load growth of the Kenai-Anchorage-Fairbanks area requires new starts of generation projects immediately. The Matanuska Electric Association, Inc., city of Anchorage, and city of Seward need new power within a year. Some temporary surplus power can be made available to them from the CEA–HEA hydro-steam-diesel complex; however, this power is fairly high cost and limited. Completion of the transmission system associated with the CEA–HEA Cooper Lake project will provide a way through which additional generation by hydro or thermal plants could be added quickly to help supply the needs developing. It is to be hoped that the proposed Bradley Lake project will be found to offer low-cost power supply and that, if so, development may begin soon.

The Ptarmigan Lake-Grant Lake hydroelectric project under consideration by the Chugach Electric Association appears to be capable of producing power at costs near those expected at Bradley.

Investigation should be carried forward quickly to allow proper evaluation of possible benefits through development of this project as an interim step. The project, although small (estimated to produce 64 million kilowatt-hours annually) could be constructed rapidly and requires only 18 miles of transmission line to tie to the Cooper Lake-Anchorage transmission system.

The Fairbanks area through interconnection of the generating plants in the city of Fairbanks (8,500 killowatts steam) Golden Valley Electric Association, Inc. (9,500 kilowatts steam), Chatanika Power Co. (4,000 kilowatts steam), and Ladd Air Force Base (88,000 kilowatts steam), can serve its developing loads for a short period—I would estimate 2 or 3 years depending on the application of the steam-electric generating plant at Ladd Air Force Base which is now to be used by the U.S. Army. All this power supply is high cost except that portion generated by the steam used for heating systems. This portion probably does not exceed 15 percent of the total capacity of the steam generating plants although exact figures are not available.

FAIRBANKS FACES CRITICAL NEEDS

Need for more power in Fairbanks will be critical in 2 or 3 years. In my opinion the best solution for added generation will require transmission lines to be constructed along the railroad to the vicinity of Healy. This line could become a part of a line toward Anchorage as previously described and could provide for connection of mine-mouth generating facilities or small hydro either of which could be constructed in 2 or 3 years. The hydro project on the Nenana River proposed by John Slagle about 2 miles upstream from Healy could be completed rapidly and although the initial installation is small I believe it will offer some improvement in power cost and with more complete development of the Nenana River system would provide

increasing amounts of lower cost power. The project has an FPC permit issued and is approaching the stage of being readied for application for a license to construct.

The Healy area is also the location of large reserves of coal which are now being mined. A mine-mouth steam plant of at least 16,500 kilowatts could produce electric power at a considerable saving over that now being generated in Fairbanks. Larger mine-mouth plants could operate at costs per kilowatt considerably below the costs now encountered for smaller plants. Good engineering and proper construction should accomplish this. These plants could be built in 2 years' time and could help supply increasing domestic loads and support completion of the minimum transmission system between Fairbanks and Anchorage.

I would like to depart from the written material here somewhat, especially in regard to this proposition of the costs, construction costs of generating facilities, hydro, steam, and otherwise. And in this respect I would like to point to the project proposed by John Slagle and described by Mr. Hanson here of the Chatanika Power Co., as indications of things that can be done privately, by individuals in Alaska. These are things which I personally believe should be encouraged.

I recognize that private individuals such as these cannot hope to accomplish the larger projects which are required for really low cost power. But these men in their enterprises, in developing projects on a private basis, in competition with all other methods, utilize methods to bring costs down that I believe are a very important yardstick in Alaska; in perhaps aiding in the reduction of costs of all of these projects, whether Government-financed or otherwise. Through the profit incentive, shall we say, they are encouraged to work hard and do just that. And I think that it is a very important yardstick in Alaska, in perhaps aiding in the reduction of costs of all of these projects, by encouraging all possible developments which can help reduce installation costs.

Alaska, historically, has depended very greatly on the military installations. The military installations being built under various pressures, not associated with keeping costs down, have set some pretty tough patterns as far as construction costs are concerned. It's my own belief that a great deal can be done to bring these costs down: that in many of these cases the costs have not been realistic; and that there is a great need to do something about that.

Most of the estimates that have been produced by the Bureau of Reclamation and the Corps of Engineers in their attempt to evaluate these projects in Alaska have been based, by necessity, on the history of the construction that has taken place in the last several years, much of which is based on the defense type of work and, which in my opinion is a very poor yardstick for many reasons. So the encouragement of these smaller developments where these private enterprises can take a crack at it, and really put their mind to work on costs, could really mean something to Alaska in setting some targets for really bringing down costs. Consequently, I believe that these people should definitely not be discouraged, but should be encouraged wherever there appears to be an opportunity that they can contribute to this power supply picture.

And occasionally I know there will be those opportunities where people can see far enough into the future to take their chances on developing something which will very likely be a good side, even with private capital, which is ordinarily quite expensive, and can come up with some competitive energy prices on an interim basis. It is my own personal belief that projects such as the Rampart cannot be accomplished in this manner, and that certainly it is going to take the tremendous resources of such as the U.S. Government to construct such a project. Its need in Alaska is very considerable, for the basic economy, which was so well pointed out by Mr. Bloch.

I didn't mean to take quite this much time, but I feel that it is important for all of us in Alaska to do everything possible to bring about a narrowing of the margin between construction costs in the other 49 States and construction costs in Alaska. Other cost margins are narrowing I think and that that margin will continue to narrow, so that it will have a tremendous impact on all of these projects that we are talking about.

The basic domestic market for electric power in Alaska can be satisfied by developing carefully selected generating projects of thermal or hydro character and matching them closely to developing needs. Real industrial use of electric power for processing or manufacturing of world products can come to Alaska only through development of large blocks of low-cost power which must be competitive on a worldwide scale. I think that becomes clearer after listening to Mr. Bloch's statement as to what type industries we are talking about when we talk about those industries which can help develop the economy we need so much here. And, just as a matter of practical fact, we must face world competition. Therefore the cost of power in large blocks must be kept in perspective, together with the competitive position of the industries that may be proposing to use that power.

In summary, Alaskan electric systems need:

(1) A new approach to transmission of small amounts of power over long distances.

(2) Continuing development of smaller blocks of relatively low cost power to match domestic load growth.

(3) Development of major hydro projects of very low cost power for encouragement of industrial expansion for competition on world markets.

Thank you.

Senator GRUENING. Thank you very much, Mr. Retherford. That concludes the list of scheduled witnesses. Is there anyone here who would like to testify, or ask any questions of any of the previous witnesses?

VOICE FROM THE AUDIENCE. Senator Gruening, I have a present for you here.

Senator GRUENING. Will you come forward please, and give your name and position?

STATEMENT OF JOE VOGLER

Mr. JOE VOGLER. My name is Joe Vogler. Here is a piece of magnetite that comes from so close to the Rampart Dam site that the engi-

neers' drills have a very good chance of finding the lode that the piece of lode came off of. I was there one summer on a mining expedition which turned out very poorly. There is a lot of lead and silver there, quite a bit of titanium, but no gold.

Now what we need in Alaska is some crop we can harvest here and sell on the international market. The only thing we have now that brings in any new money is the military payroll. The Yukon River, as long as the sun shines and continues to lift water from the ocean, will continue to run downhill, and we could export electric power and the things it makes, and that is what will populate Alaska. If the United States does not see fit to go ahead and populate—make it possible for Alaska to grow, it's a thought I don't like to bring up, but with the world's population explosion, 20 years from today it may be entirely possible that a world government may fill the voids of the earth's land surface with people picked from random sources. This may be wherever there is a population growth which has made it too thick for them to get along. They may take people of Asia, India, and Africa, and move them to portions of the surface which aren't so thickly populated, so if we do not choose to make Alaska thickly enough populated, somebody else may do it.

Senator GRUENING. Thank you very much. Is there anyone else who wishes to say anything?

I would like to ask Colonel Hanburger one more question. In that estimate of approximately one billion and a third, as the cost of the Rampart Dam, does that include the cost of relocation of the various communities that——

Colonel HANBURGER. That figure is very approximate, until you know just where they will be relocated.

Senator GRUENING. Yes. Thank you.

I would like Mr. Eyinck, if he would be so kind as to prepare a recommendation to the State government, to the Governor and the legislators, as to the type of the State setup that the chamber of commerce here feels would be appropriate in this situation. I think it—we would very much appreciate having your views on the subject, Mr. Eyinck.

Is there anyone else who wishes to ask any questions of the witnesses? Bring out any facts that have not been made clear?

VOICE FROM THE AUDIENCE. Senator, may I ask a question?

Senator GRUENING. Certainly. Will you come forward and give your name please?

Mr. REED. I am Irving Reed, resident of the Fairbanks area. I would like to ask, since I see in the paper that the Bureau of Reclamation has advocated not putting in the Rampart Dam at present, if the Cathedral Bluffs site has been considered at all. The Cathedral Bluffs has a lot of merit. It's on a road, the Alaska Highway, and it's very easily built damsite, and to my notion, it's a better damsite than the Devil's Canyon on the Susitna River, because of its ease of access, and it is not very much farther from Anchorage, and it is nearer than the one at Devil's Canyon on the Susitna River.

Senator GRUENING. Mr. Dominy, or Mr. Roberts, have you any information? Mr. Roberts, will you give your name—you have not testified here before.

STATEMENT OF DARYL ROBERTS, AREA MANAGER, BUREAU OF RECLAMATION

Mr. ROBERTS. I am Daryl Roberts, Bureau of Reclamation. The Bureau of Reclamation did look into the Cathedral Bluffs Dam site, and we made a very complete study on it. We recognize that it does have a good power potential, somewhere in the neighborhood of 100,000 to 150,000 kilowatts, but in order to have full benefit of the water, it would require quite a large reservoir. The reservoir required would inundate the area we know as Tok Junction. That would necessitate the relocating of the highway, and all the people there. That is the reason we moved away from that site. There are other sites in Alaska that would not interfere with quite such a large number of people.

Mr. REED. Well, I realized it would cover Tanacross, but I did not think it would go to Tok Junction.

Senator GRUENING. Thank you. Is there anyone else? The record will be kept open for 5 or 6 weeks. This meeting will stand in recess and a further hearing will be held in Juneau on Thursday and Friday of this week. Thank you very much.

(Whereupon the hearing was recessed, subject to the call of the Chair.)

HYDROELECTRIC REQUIREMENTS AND RESOURCES OF ALASKA

THURSDAY, SEPTEMBER 15, 1960

U.S. SENATE,
SUBCOMMITTEE ON IRRIGATION AND RECLAMATION
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Juneau, Alaska.

The hearing convened at 9 a.m., Thursday, September 15, 1960, at the Federal courthouse, Juneau, Alaska, Senator Ernest Gruening (acting chairman of the subcommittee) presiding.

Also present: Goodrich W. Lineweaver, professional staff member, Committee on Interior and Insular Affairs; and Antoinette Friedman, special assistant.

OPENING STATEMENT OF SENATOR ERNEST GRUENING

Senator GRUENING. This hearing in Juneau of the Irrigation and Reclamation Subcommittee of the Senate Committee on Interior and Insular Affairs continues a series of hearings held at various locations in Alaska for the purpose of examining the needs of the State for low cost power and local resources for supplying those needs.

Here we shall consider the need for development of supplies of low cost power for the Juneau-Douglas area, as well as for the other southeastern Alaska cities of Sitka, Wrangell, Petersburg, Ketchikan, Haines, Skagway and other communities which have power problems.

At Juneau, as at Anchorage and Fairbanks, we hope to gather the facts which are necessary to plan a practical legislative program to provide power—particularly low cost power—for Alaska.

For far too long a paradoxical situation has been allowed to exist whereby Alaska has had a totally inadequate supply of power despite the existence in all parts of the State of magnificent resources of hydroelectric power unmatched in any other part of our country. Less than one-quarter of 1 percent of Alaska's hydroelectric power potential has been developed. Although the Corps of Engineers, the Bureau of Reclamation and the Federal Power Commission have identified more than 200 potential hydroelectric power sites which could produce some 19 million kilowatts of electricity at low cost, the only Federal project ever constructed in Alaska is the Eklutna project near Anchorage which was constructed during the administration of President Truman.

This waste must be ended.

We must do everything we can to see that the facts of Alaska power needs and resources are made known and that a constructive program for power development is initiated and carried out. To do this we must plan so that each level of government—the community, the State, and the Federal Government—makes its needed contribution.

The citizens of Juneau and Douglas and the Gastineau Channel area pay higher prices for electricity than do other residents of the State, higher than they would if our hydro resources were effectively and economically developed. In this area construction of the Crater-Long Lakes division of the Snettisham project by the Bureau of Reclamation could produce the low cost power needed in the future.

Thus, at this hearing in Juneau we shall give particular consideration to the need for that project as well as listening to information and testimony concerning other possibilities.

In its report on the Snettisham project, the Bureau of Reclamation has estimated that the Crater-Long Lakes division of the Snettisham project would have an installed capacity of 48,000 kilowatts, which could be produced at a rate of approximately 6 mills. It is estimated the project would cost about $40 million, all of which would be repaid to the Federal Treasury within 50 years. It should be made clear that these Federal projects are not grants. They are self-liquidating projects. They are based on money advanced by the Federal Government. They are, in effect, loans, repayable with interest.

Our task today is to provide the information for Congress which will make it possible to enact the necessary authorization and provide appropriations to make Snettisham a reality.

I welcome your cooperation in these hearings, and I am confident they will prove of benefit to the State of Alaska.

We are very fortunate today in having a list of distinguished witnesses, and I am very happy to see the able and distinguished Governor of Alaska, the Honorable William Egan, whom we're going to be happy to listen to first. Governor Egan, if you will come forward, the mike is turned on there and I know your testimony will be most valuable for the purpose of this hearing.

STATEMENT OF GOV. WILLIAM A. EGAN, OF ALASKA

Governor EGAN. Thank you, Mr. Chairman. It is a pleasure to be here today.

Mr. Chairman, the State of Alaska with its land area of 586,000 square miles and its population of 224,000 persons is the most undeveloped area under the U.S. flag. It is strange in many ways that this should be.

Industrial growth, in addition to its need for investment capital, requires a combination of raw materials, power, and labor. Each of these ingredients need not be present in an area to justify development, but at least one must be. The most important ingredient, of course, is power, and it is our lack of development of this ingredient that is the key to Alaska's undeveloped and underdeveloped status.

Once a supply of cheap power is provided in an area, industrial development follows. Labor and industry move in to evaluate the known deposits of raw materials and development results. Exploration for new or hidden resources follows, using continually improving modern techniques. Each new industry created demands new services, as does the increasing population.

Alaska does have tremendous power potential, both in water and in fossil fuels. The hydroelectric potential has been well evaluated by the Corps of Engineers and by the Bureau of Reclamation, although considerable research is required before feasibility of con-

struction and power costs are known with certainty. Our coal, oil, and natural gas potential is apparently large but relatively unproven.

Power development in Alaska to date has been largely financed either through issuance of municipal revenue bonds or through REA loans to local rural electric cooperatives. The large hydroelectric projects which would develop truly low-cost power—Rampart, Susitna, Wood Canyon, and Taiya—would require long-term financing at low-interest rates, available only from the Federal Government on the usual basis of full repayment by the consumer.

Federal financing is also necessary for the prompt realization of the energy potential of smaller projects, such as Bradley Lake, Snettisham, Lake Chakachamna, and others, for which there is such urgent need.

In the case of Snettisham, construction of two potential industrial developments in the Juneau area is contingent upon the availability of a reasonably large block of power. The U.S. Forest Service has long recommended the Juneau-Douglas area as the logical site for one of the four pulp mills considered feasible for utilization of timber from the Tongass National Forest on a sustained-yield basis. One concern presently holds a preliminary award of a contract on 7½ billion board feet of timber in this area. Other concerns are interested in this development should the proposed purchaser fail to exercise his option which expires in July of 1961.

The Snettisham titaniferous magnetite deposit, held jointly by two independent groups, will require approximately 80,000 kilowatts of firm power if these iron ore reserves are to be mined and receive the necessary electrometallurgical treatment economically.

These needs are over and above the normal requirements of the rapidly expanding area.

The question is often asked, "How can you justify the development of one or more of these large blocks of power? Where is the consumer?"

Recent history, of course, is replete with the answer to this question. One has only to look, for example, at the Pacific Northwest where those who opposed the construction of Grand Coulee Dam on identical grounds have found that, rather than a surplus, this great project has generated not only power but an ever-increasing demand for it—with accompanying industrial growth.

This same question, with the same answer, has been asked in each and every area of the Nation which has developed industrially. Most of these areas, in fact, can no longer grow, for the power potential has been fully developed and committed.

Industry must look to new undeveloped areas if it is to expand to meet the increasing need for more and new products and services demanded by the Nation's rapidly growing population.

It must also be borne in mind that the extremely large hydroelectric projects considered here will take many years to complete. All population centers of the State are finding themselves already limited as to expansion possibilities because present power supplies are stretched to the limit. Meanwhile, Alaska's population is growing at a rate of four to five times that of the rest of the Nation.

Even if the "green light" were given tomorrow on one of these large hydroelectric projects, local demands would require development of supplemental power sources to fill the gap until such time as the large development could deliver power.

A moment ago I mentioned Grand Coulee Dam and the Pacific Northwest. The vital role which the light metals industry played during World War II, made possible only by the low-cost power developed in the Columbia River system, is well known.

With only slight differences, the situation in which the United States finds itself today could be likened to those days of the early 1940's. Our Nation as a whole is in a poor position as to self-sufficiency in many raw materials. The electrical energy which once produced the materials of war has now been absorbed by civilian demands.

At the same, Alaska, a vast land area one-fifth the size of the rest of the Nation, remains undeveloped both as to power and other resources. While this situation continues, our Federal Government continues to spend large sums in foreign countries building dams and developing industry in direct competition with our own.

Foreign raw materials and manufactured products, developed under cheap labor conditions and with financial assistance under our foreign aid policy, are imported into the United States in direct competition with similar products developed by domestic industry without Government aid.

Certainly any undeveloped portion of our own country should be entitled to development assistance on a reimbursable basis, if the Federal Government can afford to "write off" loans under our foreign aid program.

The State of Alaska fully supports and requests additional Federal appropriations necessary for the continued and detailed studies of the proposed Rampart, Susitna, Wood Canyon, Snettisham, and other suggested hydroelectric projects. Once feasibility has been determined, construction should be authorized and commenced as promptly as practicable.

Of the various projects which I have mentioned, there are two—Rampart and Wood Canyon—which in the view of the Alaska Department of Fish and Game could have major effect upon the fish and game resource.

Because of varying concerns in this regard and the inability, based on present knowledge, to speak definitively on the subject, it is essential that there be considerable research on problems which would arise.

In the case of Rampart, a coordinating committee has been formed including members of the Alaska Department of Fish and Game and several members of the Fish and Wildlife Service. This committee has formulated research plans and budget estimates for submission to the Department of the Interior and the Corps of Engineers in Washington. The research proposed would be aimed at evaluating the hazard to fish and game and finding ways to mitigate losses, particularly with respect to anadromous fish. The Department strongly recommends the support of the Congress in obtaining the necessary funds for this study, the minimum cost of which is estimated at $845,000 through fiscal 1964.

In the case of Wood Canyon, the Department urges a complete program of research leading to the solution of the problem of successfully passing adult salmon upstream and juvenile salmon downstream at high-head dams.

Other projects which we have mentioned today, in the opinion of the Department, would have only minor effect on fish and wildlife. One, the Taiya project, could have a beneficial effect on the fishery by introducing interior continental waters into the new river which it would form.

In the case of each of these projects, however, the Department would urge that public access for fishing and hunting and provision for additional detailed studies of fish and game during the course of project development be incorporated into the language of the project authorization.

I feel I should make clear at this time that in citing the views of the Alaska Department of Fish and Game it is neither its intention nor mine to place obstructions in the way of necessary development. Rather, it is a desire to encourage essential research which, I am certain, will bring about the solutions necessary to hold damage to other resources at a minimum.

A vigorous and sensible program for development of our water-power resource, bearing in mind the principle of multiple use as set forth in Alaska's constitution, will cause this State to progress industrially in a manner that will serve to bring credit and economic stability to our 49th State.

I thank you very much Mr. Chairman.

Senator GRUENING. Governor Egan, we appreciate your statement very much. If it is agreeable to you I would like to ask one or two questions for the record.

We inspected yesterday, by flight, the Crater-Long Lakes project. Of course we have studied it; it is ready to go. Is it your opinion that the Juneau-Douglas area, including the Gastineau Channel area, will need additional power in the course of the next 4 or 5 years? Assuming that even if Long Lake project were authorized, appropriated for, and initiated in the next year it would not be completed in less than 4 years. Is it your view that this community will need additional power by that time?

Governor EGAN. I think it has been amply pointed out by committees and commissions that have studied this problem in this particular local area, Mr. Chairman, that will be so. Regardless of the completion of the Snettisham project, this area will need additional power even at an earlier time than that project can possibly be completed.

Senator GRUENING. Then you would recommend to the Congress that we secure an authorization appropriation for this project at the earliest moment?

Governor EGAN. Well, I have, Mr. Chairman, in the past recommended very strongly that authorization and appropriations for this project be effected at the earliest possible time.

Senator GRUENING. You would feel that even if there are no additional power users brought into the field, the community would still need this additional power?

Governor EGAN. Mr. Chairman, the projections that have been made, and I am certain that you have conducted various previous studies on this subject, certainly show that it will be necessary to secure a large block of additional power, regardless of what happens in relation to the construction of the Snettisham project.

Senator GRUENING. Isn't it also reasonable to anticipate a very substantial growth in the capital and adjacent areas and therefore increase power needs over what we now have?

Governor EGAN. That is going to be so, Mr. Chairman, and not only in this area, Mr. Chairman, but all over the great State of Alaska.

Senator GRUENING. So we really are facing a dangerous power shortage unless we proceed with this hydro development or similar developments?

Governor EGAN. We are facing that dangerous power shortage at the present time.

Senator GRUENING. And it might possibly impair the functioning of the government and of the community unless we do get such power. Is that not a fact?

Governor EGAN. It will very definitely impair the natural growth of the community.

Senator GRUENING. Thank you very much, Governor Egan. The record will be kept open for several weeks and any additional testimony that you or members of your administration desire to submit will be included. Thank you very much.

Governor EGAN. Thank you very much.

Senator GRUENING. I want to say that we want to keep these hearings quite informal. After the various witnesses who are scheduled have appeared, we will be prepared to have people from the audience ask questions so that all facts that are relevant will be brought out.

I would like to ask commissioner of natural resources, Mr. Phil Holdsworth, whether he wishes to testify at this time or whether he would prefer to wait and ask questions?

STATEMENT OF COMMISSIONER PHIL HOLDSWORTH

Commissioner HOLDSWORTH. Mr. Chairman, the statement just given by Governor Egan is the State position of the administration. I would be very glad to remain and answer any questions that may come up.

Senator GRUENING. Thank you very much. I think your remaining here would be very helpful. This is a matter with which your department of natural resources has much concern and I am hopeful that this department in conjunction with the Governor's office and the legislature, will develop a program for full State cooperation, not merely in this project but in other hydroelectric projects which are needed throughout the State. So far the activity concerning these projects has been either Federal and municipal or local, but now that Alaska has become a State, it seems to be imperative that the State move in and participate fully according to what it seems desirable to have us do. And I hope such a program will be developed in the very near future. And that the research will include all these projects; research bearing on land use, mineral resources, fish and wildlife resources, and all the other incidentals which really will affect practically every department of the government, that these all be included in such a study and in such a cooperative venture.

I think next I would like to call on the mayor of the city of Juneau, Mayor Lauris Parker.

Mayor Parker, we are very happy to have your testimony. We know how concerned you are with the growth of the city of Juneau and the adjacent areas and I think we fully know how much you appreciate the importance of power development to this entire community. So we are very happy to have you here.

STATEMENT OF MAYOR LAURIS PARKER

Mayor PARKER. Thank you, sir. First of all, Senator Gruening, I must apologize for not having prepared a number of copies of this statement.

Juneau's determination to accept its position as the State capital has worked a hardship on some of the things we wanted to do—certainly it has accelerated local project development with an ever-increasing demand for time. I am not unhappy to have to make such a statement I'll assure you.

This statement will be brief but I do not want its brevity to subtract from its importance. Juneau needs electrical power for its development. This is being said again and again here today and we will continue to say it tomorrow and the days following simply because it is true.

Juneau, like all of southeast Alaska, is continually more dependent upon gaining its livelihood from the sea and the soil. In such an economy power is a most important factor.

Juneau's own electrical power situation is in such a state of confusion that I hesitate to review it for the committee but I feel that it should be made a matter of record. All of our local hydropower sources are owned by the A. J. Industries of Los Angeles. Power from these sources is brought to consumers on a distribution system owned and operated by the Alaska Electric Light & Power Co., which is headquartered in San Francisco, but managed locally. Now, I am speaking strictly of Juneau when I say that, because we will have estimony later today to show that there are other people taking power to consumers. The city has never dealt directly with A. J. for power but has left this job to the power company. In 1958 a 50-year franchise with the power company terminated and we are presently working together without any contract. The city administration tried to solve this problem a year ago but the voters did not accept the franchise that was offered. Power is also produced by the power company through diesel generation.

Juneau has continually evidenced an interest in the local power situation and as recently as last winter, city representatives went to Washington, D.C., to try and clear the subject of "preference customers" so that they might better establish their position in the local power picture. Finding an answer to the question of who is a "preference customer" is harder than finding money to build a dam. It was quite evident after a short time, that we had taken the hardest question first—so we left this to the experts and went back to talking local development. I have said this to show our interest and to indicate the extent to which the city will go in trying to solve our local and regional problem. Right now we are seeking qualified engineering advice to assist in writing a good franchise.

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We are prepared to do anything within reason to promote the development of local hydropower. We have even looked into the possibility of using atomic reactor power in this area because of transmission problems. Development of transmission facilities suitable to this area, I believe, could stand more emphasis. Better than one-eighth of the Snettisham project cost goes to this one item alone—I got these figures from the report, I believe that is true. Reactor-generated power might find utilization here due to this one factor. The point is, we are seeking new ideas and trying to promote those that are already in use.

Locally we want to promote the harvesting of our forest resources. We feel that our mineral wealth will become increasingly significant. This is especially true if the U.S. area of trade continues to be cut away by communism. The new interest that citizens of the South 48 are showing in Alaska is even causing local concern. Each new family that moves into this area increases our demand for energy and these simple daily demands multiplied at first by tens and then by hundreds add up to a lot of kilowatts. Our last census doesn't indicate any startling change in the area populations, but it has happened and will continue to increase in intensity as those outside learn of our way of life. I ask, too, that the committee consider the increase in demand brought on by the rising standard of living in this area. I think this is especially true; when I wrote it I was thinking of many of my native constituents who are living a much better life today than they lived 5 years ago and much better than 10 years ago and I think that is going to increase our power needs.

That brings up another point in Alaskan power problem consideration which I do not want the committee to miss. Proper consideration of Juneau's problem cannot be given without considering Douglas, the airport area, and the large populated area to the northwest of Juneau. Separation by communities is not too practical an approach to our problem. Our electric power problem is broader in scope than just this city and consideration of the problem will have to focus on the area. Locally we try to work together toward solutions of mutual benefit but there is definitely a reluctance to lead when the channels of communication and government are as diverse as they are here. I feel that this hampers progress in meeting some of the bigger problems that we have to face.

Senator, I have not included a lot of figures here since there are several experts who will be far better prepared in this field. My aim is to satisfy the committee that we are interested in our own growth and future and that we do stand ready to back these words with activity and money when the opportunity presents itself. We know that power can mean life in this area. It is the blood that will transform our natural resources into a better way of life for our people.

Thank you sir.

Senator GRUENING. Thank you very much Mayor Parker. Mayor Parker, do you anticipate a substantial growth in this community in the next 5 years?

Mayor PARKER. I do sir.

Senator GRUENING. What do you consider the power situation will be in 1964–65 here if we do not furnish additional sources of power?

Mayor PARKER. I think that we can even consider it critical at the present time and it is going to be even more critical if we do not develop more power. I think that one point should be made here. Certainly we can have power from other sources but we have got to have power that we can pay for and that is one of the things that I think we are here today for, is to assure ourselves that we have power that we can pay for. We can have power but we cannot pay for it, not on the local economy that we have and so that is what we are working toward now is something that we can pay for, sir.

Senator GRUENING. In other words you not only need more power but you would like to have it at rates that are reasonable and within the capacity of the users to meet.

Mayor PARKER. It must be that way. As I have said here, as far as Southeast Alaska is concerned and as far as this area is concerned, we are going to depend upon the soil and upon the sea for our livelihood. Now in order to meet that type of an economy we have got to have some reasonable cost power. I hope it is cheap, but then we can't use that word.

Senator GRUENING. Thank you very much Mayor Parker. We have present with us today a representative of the Alaska Electric Light & Power Co., Mr. Franz Nagel, who is certainly fully informed on the power consumption and requirements of this community which the Alaska Electric Light & Power Co. serves.

Mr. Nagel we are very happy to hear your testimony.

STATEMENT OF FRANZ NAGEL

Mr. NAGEL. Mr. Chairman, I would first like to state that the power situation as portrayed is critical in this area. Last winter with all operating sources of power there was a scant 2 percent reserve for this area. With a normal load growth, based on 14 years' experience, of 7.1 percent compounded annual growth in-load in the Juneau-Douglas and associated areas that would point toward a deficiency for the coming winter of approximately 5.1 percent.

This situation if allowed to continue, even for this year, would mean that this area of necessity will suffer rationing of power. There is a definite need for provision of additional sources of power preferably of low cost power.

There are two possible courses that this area might take in the development of the electrical demand of the area. One would be the normal growth that we have experienced during the past 14 years at the rate of 7.1 percent compounded annually. This means that approximate doubling of the electrical demand of the area every 10 years. In 1959 the electrical demand of this area was 26.5 megawatt-hours and the demand was 5,730 kilowatts. Based on a 7.1 percent compound increase in load by 1964 that load would be 37.1 megawatt-hours annually and the demand would be 8,020 kilowatts.

A second course that could develop for this community would be the coming in of the Georgia-Pacific Alaska Co. or some other firm to construct a newsprint plant. In that case there would be quite an influx of workers to man the plant and service industries that would cause a substantial increase in population of this area over and above the previously mentioned 7.1 percent annual growth in load.

Projecting this is based on the information I have been able to develop as to the proper manning of such a plant. Starting at the same base figure of 1959, with a 26.5 megawatt-hours consumption annually and 5,730 kilowatts load, and projecting it to 1964 we have come out to an annual consumption of 43.4 megawatt-hours and the peak load, integrated 60-minute demand of 9,300 kilowatts. This is considering only the residential, commercial, and Government office loads in this area. Power required by a newsprint mill itself would be added to that figure.

In the first case, which I am personally very reluctant to accept, namely the same rate of growth as we have experienced in the past 14 years, but just to accept it as a possibility, there is no possible source of power in this area which could be developed to produce power at a cost of less than 17 mills.

In the case—the second case—of the introduction of heavy industry, that would produce the power market to permit and enable the development of lower cost sites such as the Snettisham project. We are very much concerned about the development of additional lower cost sources of power in this area and we endorse and would welcome the development of the Snettisham project. But we would caution that unless there is a coincidental development of industry the cost of power would be extremely high from such a project, assuming that the operating costs were to be repaid. Because without a customer to use the power we have only the local power demand to supply from that project. It would appear that the cost of that power, if the project costs were to be repaid, would have to be at least 30 mills, which would gradually reduce over a period of years. However, the indications are that the project would encourage the development of industry in the area and that it would be wise and we wish to endorse it.

Senator GRUENING. Thank you very much, Mr. Nagel. You have lived in this community for a good many years, have you not? How many?

Mr. NAGEL. Thirteen years.

Senator GRUENING. And you have been connected with the power company during that period of time.

Mr. NAGEL. The entire time.

Senator GRUENING. What is your opinion to the probable growth of this community in the next 5 to 10 years?

Mr. NAGEL. In the next 5 to 10 years it is my estimate that we will advance at a rate of close to 10 percent per year until such time as a large industrial development is a reality.

Senator GRUENING. Well, now you say that if we do not get an additional power user, such as the pulp and paper company, and the Snettisham project were developed to meet the local foreseeable power shortages, that the rate might be as high as 30 mills. Is that correct?

Mr. NAGEL. That is correct.

Senator GRUENING. Is that higher or lower than the rate which is now being paid by the people of this community?

Mr. NAGEL. That is substantially higher. The cost of power production at this time including that power which is purchased from the Alaska Juneau Industries and that which we generate ourselves with our own diesel generators and hydro generators would average approximately 16 mills.

Senator GRUENING. Prior to transmission?

Mr. NAGEL. That would be after transmission.

Senator GRUENING. You say that your community is now getting power at 16 mills?

Mr. NAGEL. That is correct. An average cost to us would be the wholesale rate.

Senator GRUENING. Assuming that there was no immediate additional user in sight at the present time, even though one might be anticipated in the course of the next 2 or 3 years, would you recommend that the Congress go ahead and build the Snettisham project?

Mr. NAGEL. I believe that the community will grow and by the time that project could be completed there will be within sight a sufficient demand for the project so that the Congress should proceed with the project.

Senator GRUENING. In other words, your recommendation is that we should do whatever we can to get this project authorized and initiated and completed at the earliest possible moment?

Mr. NAGEL. That is correct.

Senator GRUENING. Thank you very much, Mr. Nagel. I would like to say that anytime, if anybody present has any questions they would like to direct to any of the witnesses, I will keep these hearings open and sufficiently informal so that may be done, and so that no aspect is overlooked by the chairman and that all pertinent points are brought out.

We have in Mr. Nagel, a very valuable witness. He is very familiar with this subject. He has lived with it for over a decade. He is very much concerned with the development of power here and we are very glad to have him here.

Mr. NAGEL. Thank you. I might add that one thing that might be pertinent. If the Snettisham project were completed and if the power were made available at a rate between 6 and 7 mills, it would be possible for us to affect an average rate reduction of approximately one-third.

Senator GRUENING. Mr. Nagel, what would be the alternatives if Congress should decide not to authorize this project in the absence of an additional industrial power user?

Mr. NAGEL. You mean what would this community do?

Senator GRUENING. Yes; what would we do?

Mr. NAGEL. As I said, last winter we had a 2-percent reserve. Something has to be done to meet that situation. We are taking steps to install—in fact, ground is being broken today for an additional diesel electric generator unit. That will tide this area over for an additional year, possibly 2 years. That sort of progress would be made—that sort of temporary expedient would be taken to provide backup diesel power with diesel electric generation until such time as a larger low-cost source of power were made available

Senator GRUENING. Could you tell us about how much this additional installation will cost the company?

Mr. NAGEL. The installation that we are making at this time, due to the fact that we were able to locate a piece of good used equipment, will cost us approximately $85,000.

Senator GRUENING. Will that increase in capitalization be reflected in any change in the rate?

Mr. NAGEL. We do not anticipate any change in the rates.

Senator GRUENING. Thank you very much, Mr. Nagel. I think now we should hear from the Bureau of Reclamation, either from Commissioner Dominy or the district manager, Mr. Daryl Roberts, on the Snettisham project.

Commissioner DOMINY. Mr. Chairman, with your permission, I would like to introduce Mr. Daryl Roberts also so that the two of us may testify jointly in presenting to the committee the details on the proposed Snettisham project.

Senator GRUENING. I think the record requires that you state that you are the Commissioner of Reclamation of the United States, Floyd E. Dominy.

STATEMENT OF COMMISSIONER FLOYD E. DOMINY

Commissioner DOMINY. Mr. Chairman, I am Floyd E. Dominy, the Commissioner of the Bureau of Reclamation, Department of the Interior, and I have with me here today Mr. Daryl Roberts, who is the district manager for the Bureau of Reclamation, Alaska area. Mr. Roberts has been here in Alaska since 1948 and is responsible for the development of the Snettisham project report, among his other activities.

During the past week, Mr. Chairman, we have traveled many miles, by land and by air, over this great State, and we must all have been deeply impressed by the enormous undeveloped resources of land, minerals, forest, and water which we have seen. We are now in the capital of the State, in southeastern Alaska, where the problems and probable solutions are quite different from those in the rail-belt area. The topographic difficulties which are faced in attempting to intertie electrical systems in southeastern Alaska make the cost of such facilities prohibitive. Fortunately, those same topographic characteristics provide numerous opportunities for the development of efficient but smaller hydroelectric projects which can serve the needs of individual cities and immediate surrounding areas.

Juneau is typical of this situation. Continuation of the historical load growth in the vicinity of Juneau will make it necessary almost immediately that something other than the existing power-generating facilities be installed. The previous witness, Mr. Nagel, certainly has put into the record detailed information to support that statement.

The total requirement for power however under the historic growth pattern, would not in itself justify the construction of even a medium sized hydroelectric project. The establishment of a new industry in this vicinity is imperative in my judgement, to continued population and economic growth.

The raw materials for such an industry fortunately are close at hand, and steps have been taken to develop them more fully. The U.S. Forest Service has granted timber rights in the Tongass National Forest to the Georgia-Pacific Alaska Co., for the construction and operation of a pulp mill. The operation of such a mill would not be feasible, however, without an adequate and dependable source of comparatively low-cost hydroelectric power. This situation was the basis and justification for the Bureau of Reclamation's studies of the Snettisham project. A plan has been devised whereby the waters of Crater and Long Lakes, about 35 miles southeast of Juneau, can be tapped and led to a powerplant at tidewater on Speel River. This

plant would have an installed capacity of 48,000 kilowatts and an average annual energy output of about 306 million kilowatt-hours. Such a plant could supply the power requirements of the pulp mill as well as the requirements for commercial and domestic use throughout the Juneau area for many years to come.

The Bureau of Reclamation has prepared a report on this project which we know as the Crater-Long Lakes division of the Snettisham project, and that report has been released to the general public. It has been received with general approval and enthusiasm. It has been recommended by the Secretary of the Interior, based on the Commissioner's report, and we have just last week received from the Bureau of the Budget the authorization to transmit that report to the Congress as a recommended project, supported by the administration.

The documents to actually transmit it to the Congress for consideration are on the Secretary's desk this moment for signature so that within a matter of a few days this official report—a feasibility report—with the engineering studies completed, with all the details of record will be recommended by the Secretary of the Interior to the Congress for authorization.

Senator GRUENING. Mr. Commissioner, under those circumstances I think we should keep the record open so that these papers may be all included as part of the record as they are extremely important. So we will keep the record open and will ask you to transmit them to the committee just as soon as they are actually available.

Commissioner DOMINY. Yes, sir, we will do that and I would say at this point of the record that as I understand it the Bureau of the Budget has urged in its letter clearing our report for transmittal to the Congress that every attempt be made to construct the project through local financing and that only in the event that it is infeasible to construct it by local financing, that it be considered for Federal financing. We of course from the Bureau believe that the facts are well known, that it could not be approached as a project locally financed and we believe that this could be made of record, to fully satisfy the Budget Bureau on that point. The Budget Bureau goes on to recommend that the authorizing language provide that construction of the project not be commenced until agreements for sale of the power have been entered into to repay all of the cost within 50 years. The Budget Bureau letter and the official transmittal letters will be made a part of this record at this point, if you wish, in the committee's deliberations.

Senator GRUENING. It will be included.

(The following correspondence was subsequently submitted:)

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., September 22, 1960.

Hon. SAM RAYBURN,
Speaker of the House of Representatives,
Washington, D.C.

DEAR MR. SPEAKER: The attached report on a plan of development for the proposed Crater-Long Lakes division, Snettisham project, Alaska, is transmitted herewith under the provisions of the act of August 9, 1955 (69 Stat. 618).

This proposed project would be a single-purpose hydroelectric power development to serve the present and anticipated future power needs of the city of Juneau, Alaska, and adjacent areas, and of a new industrial development. It is a financially feasible and economically justified project which will be consistent with the policy of the Congress, as expressed in the act of August 9, 1955, of encouraging and promoting the development of Alaska.

The proposed report on this project was transmitted to the State of Alaska and to the interested Federal agencies for review, and copies of the comments which have been received are attached to the report. The report and copies of the comments received were transmitted to the President. A copy of a letter dated September 2, 1960, from the Acting Director of the Bureau of the Budget indicating that the President has no objection to the submission of this report to the Congress is attached.

We recommend that construction of the Crater-Long Lakes division, Snettisham project, Alaska, be authorized as set forth in our report.

Sincerely yours,

ELMER F. BENNETT,
Acting Secretary of the Interior.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., September 2, 1960.

The Honorable the SECRETARY OF THE INTERIOR.

MY DEAR MR. SECRETARY: This will acknowledge your letter to the President, dated July 4, 1960, submitting your report on a plan of development for the Crater-Long Lakes division, Snettisham project, Alaska.

The proposed project would provide for power development by diversion of water from the Crater and Long Lakes to a powerplant to be constructed near Port Snettisham, about 28 miles southeast of Juneau, Alaska.

The first cost of the project is estimated at $38,400,000. Using a 3-year construction period and an interest rate of 2½ percent, the total Federal investment is stated to be $40,090,000 all allocated to power. Total annual economic costs, based on a 50-year period of analysis and an interest rate of 2½ percent, are stated to be $1,726,000 and total benefits are estimated at $2,377,200. The resulting benefit-cost ratio is 1.38 to 1.

According to the report, the investment would be repaid with interest in 50 years from net revenues of power sales at rates of 6.1 mills per kilowatt-hour for firm energy and 4 mills per kilowatt-hour for nonfirm energy. The repayment analysis is based upon the expectation that a very substantial industrial load will develop if an adequate supply of power is available at these rates. According to the report, such a power requirement is anticipated in the projected establishment of a newsprint mill near Juneau and you state that contracts have been negotiated with a responsible company by the Forest Service for the use of timber resources of the Tongass National Forest in such a mill. Since the operation of the pulpmill would not be feasible without an adequate supply of power at the comparatively low costs contemplated by this development, the project and the pulpmill are mutually dependent. We note that prior to project construction you propose to require firm contracts for the purchase of power and energy sufficient to assure repayment of the Government investment within 50 years. We agree that this is desirable and would recommend that the authorizing language specifically provide that construction of the project not be commenced until agreements have been entered into that would insure the sale of power at rates sufficient to repay all costs with interest within 50 years.

You indicate that this project will contribute toward this administration's objective of promoting and encouraging economic development of the resources of Alaska. We believe, however, that under the administration's power policy non-Federal interests should be encouraged to accept responsibility for power development whenever possible. Therefore, we suggest that prior to authorization of the proposed development further efforts be made to encourage State or local governmental agencies or business interests to finance and construct the project. However, if construction by non-Federal interests cannot be arranged, we would not object to construction of the project by the Department of the Interior.

Subject to your consideration of the above comments, you are advised that there would be no objection to the submission of the proposed report to the Congress. No commitment can be made at this time as to when any estimate of appropriation would be submitted for construction of the project, if authorized by the Congress, since this would be governed by the President's burgetary objectives as determined by the then prevailing fiscal situation.

Sincerely yours,

ELMER B. STAATS, *Acting Director.*

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., July 4, 1960.

THE PRESIDENT,
The White House,
Washington, D.C.
(Through the Bureau of the Budget).

DEAR MR. PRESIDENT: My report on a plan of development for the proposed Crater-Long Lakes division, Snettisham project, Alaska, is transmitted herewith under provisions of the act of August 9, 1955 (69 Stat. 618).

This proposed project would be a single-purpose hydroelectric power development. It would provide for the power requirements of the city of Juneau and adjacent areas for some time to come, and in addition would encourage the establishment of a pulpmill to utilize the timber resources of the Tongass National Forest. Contracts for the use of these timber resources have been negotiated by the Forest Service with a responsible company. I am assured that, except for the lack of an adequate power supply at reasonable rates, this new industry would already have been established. I also understand that power and energy at the rates contemplated in the attached report are within the limitations for economic operation of the industry. I am convinced that this project could not be financed by private industry or local governmental agencies.

The proposed report was coordinated with the State and the affected Federal agencies as required by the Flood Control Act of 1944, the Fish and Wildlife Coordination Act, and interagency agreements. Copies of the comments received as a result of that coordination are attached to the report.

I believe this project will fill an urgent need for adequate electric power in the vicinity of Juneau and will contribute toward this administration's objective of promoting and encouraging the economic development of all the resources of the State of Alaska. Prior to project construction, I propose to require assurances in the form of firm contracts for the purchase of power and energy sufficient to assure repayment of the Government investment within 50 years.

I recommend that the plan of development for the Crater-Long Lakes division, Snettisham project, Alaska, be authorized as set forth in my report. I shall appreciate having advice concerning the relationship of this project to your program before I transmit the report to the Congress for consideration and appropriate action.

Sincerely yours,

FRED A. SEATON,
Secretary of the Interior.

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., June 20, 1960.

The SECRETARY OF THE INTERIOR.

SIR: This is my report on a plan of development for the Crater-Long Lakes division, Snettisham project, Alaska. It is based on and includes my proposed report of February 3, 1960, which you approved and adopted as your proposed report on February 27, 1960.

Copies of your proposed report were transmitted to the State of Alaska and the interested Federal agencies for review as required by law and interagency agreement. Comments have been received from the Governor of Alaska and from all the Federal agencies. Copies of those comments are attached to and made a part of this report.

We have received no adverse comments or indications that the proposed project would in any way conflict with the programs of other agencies. Strong endorsement of the project plan was received from the Governor of Alaska and the Department of Labor. The Chief of Engineers, Department of the Army, noted that there is no apparent conflict between the proposed plan and existing projects or plan of the corps. The letter from the Department of Agriculture suggested minor relocations of facilities to preserve scenic values and indicated the potential value of the project for the expansion of the forest industry, tying into existing contracts of the Forest Service for timber operations. The Coast and Geodetic Survey offers assistance in establishing control points for survey purposes. The Public Health Service pointed out the necessity for preventive measures to avoid creation of mosquito breeding areas.

As the nature of the comments received is favorable and because the suggested minor changes in plan can easily be accommodated in the course of project development, no revision of the proposed report is necessary.

Accordingly, I recommend that you approve and adopt this as your report on the Crater-Long Lakes division, Snettisham project, Alaska, and that you transmit it together with the attached comments to the President and subsequently to the Congress in accordance with the provisions of the act of August 9, 1955.

Respectfully,

FLOYD E. DOMINY, *Commissioner.*

Approved and adopted July 4, 1960.

FRED A. SEATON,
Secretary of the Interior.

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., February 8, 1960.

The SECRETARY OF THE INTERIOR.

SIR: This is my proposed report on the Crater-Long Lakes division, Snettisham project, Alaska. It is based on and includes the attached report of the district manager dated July 1959 and appended reports of the Fish and Wildlife Service and the Forest Service. The invetsigation and the report on this potential project were authorized to be made under the act of August 9, 1955 (69 Stat. 618).

This proposed water resources development is a single-purpose hydroelectric power project, designed to meet present and expected power requirements for municipal, domestic, and industrial purposes in the Juneau area. There is no opportunity for multiple-purpose development of the water resources for agriculture, municipal, and industrial uses, flood control, or recreation. The effect of the proposed development on the fish and wildlife resources would be limited, but provision for further study of means to mitigate damages or to enhance those resources as a project purpose is recommended.

The Crater-Long Lakes division of the Snettisham project consists of tunnels from Crater Lake and Long Lake leading to a single powerplant at tidewater on Speel River and the necessary transmission facilities to deliver the power to the Juneau area. The natural lakes are at normal elevations 1,022 and 815 feet above mean sea level, respectively. The proposed tunnel intakes would be at such elevations as to permit drawing down the natural levels of these lakes by 200 feet and 165 feet, respectively, thereby creating about 270,000 acre-feet of active storage regulation. The pressure tunnel from Crater Lake would be 7 feet in diameter and 6,175 feet long, ending in a 20-foot diameter surge tank. The tunnel from Long Lake would be 9.5 feet in diameter and 8,150 feet long, with a similar surge tank. Steel penstocks would lead from the surge tank to the powerplant.

The powerplant will consist of three turbine-generator units, providing a total installed capacity of 48,000 kilowatts and an average annual energy output of about 306 million kilowatt-hours. This power would be delivered to Juneau over a 115,000-volt transmission line 38.7 miles long, 2.7 miles of which would be in submarine cable under Taku Inlet.

The cost of constructing these works under prices as of April 1959 is estimated at $38,400,000, all of which would be allocated to power. The total Federal investment, which includes interest during construction, would be about $40 million. This investment could be repaid with interest in 50 years from net revenues of power and energy sales at rates of 6.1 mills per kilowatt-hour for firm energy and 4 mills per kilowatt-hour for nonfirm energy. Average annual benefits exceed average annual costs in the ratio of 1.67 to 1 for a 100-year period of analysis and by 1.38 to 1 for a 50-year period. Indirect or secondary benefits which will be realized are of great importance but are not included in these benefit-cost ratios. The project as proposed for development is found to be economically justifiable.

Continuation of the historic load growth in the Juneau area would require many years to absorb the energy of the Crater-Long Lakes division of the Snettisham project as herein proposed. The repayment analysis is based upon the expectation that a very substantial industrial load will develop if an ade-

quate supply of power becomes available at these rates. Such a power requirement is anticipated in the projected establishments of a newsprint mill near Juneau by the Georgia Pacific Alaska Co. This company has the necessary timber rights and hopes to be able to build the mill and other facilities quickly. The operation of the pulp mill is not feasible, however, without an adequate source of comparatively low-cost hydroelectric power such as would be provided by this proposed development. The Crater-Long Lakes division, Snettisham project, and the pulp mill, therefore, are mutually dependent. In this connection, the city of Juneau and the Georgia Pacific Alaska Co. have expressed their desire for this project and their willingness to contract for power in such terms that we are confident the bulk of the power could be contracted for without delay.

The power market forecast for the Juneau area is as follows:

	1958	1965	1975
Total utility load (kilowatt-hours)	24, 402, 000	47, 900, 000	89, 720, 000
Large industrial loads (kilowatt-hours)	1, 938, 000	[1] 230, 000, 000	[1] 230, 000, 000
Total energy requirements (kilowatt-hours) (includes losses)	30, 174, 000	292, 520, 000	336, 550, 000
Capacity requirements (kilowatts)	6, 310	43, 030	53, 060

[1] Provides energy requirement for pulp mill only. Other potential industrial loads might increase this figure substantially.

The Crater-Long Lakes division, Snettisham project, if built in accordance with this report, will be an important project to the State of Alaska, in harmony with the purposes declared by the Congress in passing the act of August 9, 1955, "* * * for the purpose of encouraging and promoting the development of Alaska * * *." This purpose can best be accomplished by making a plentiful supply of low-cost power available to attract industrial and commercial enterprises, rather than the more conservative approach of providing power as needed to supply such loads as they occur.

I concur in and adopt the recommendations of the district manager as set forth on pages 76 and 77 of his report for the development of this division of the project, with such modifications of, omissions from, or additions to the works as you may find proper and necessary for carrying out the purposes of the project.

Subject, of course, to consideration of the comments received, I recommend you approve and adopt this as your proposed report on the Crater-Long Lakes division, Snettisham project, and authorize me to send the report, on your behalf, to the Governor of Alaska and the Secretary of the Army in accordance with the provisions of the Flood Control Act of 1944, to the Governor for the comments of the head of the State agency which administers the fish and wildlife program of the State in accordance with the Fish and Wildlife Coordination Act of 1958, and to other Federal agencies in accordance with interagency agreement on coordination of reports.

Respectfully,

FLOYD E. DOMINY, *Commissioner.*

Approved and adopted February 27, 1960.

FRED A. SEATON,
Secretary of the Interior.

Commissioner DOMINY. This proposed project demonstrates on a small scale what I conceive to be the Federal Government's role in promoting and encouraging the economic development of Alaska. It demonstrates the necessity for building power projects, not only to meet a demonstrated power shortage, but to promote future industrial opportunities and provide a favorable economic plan for the establishment of industries which would utilize the natural resources of the State to promote the economy and well-being of the area, State, and Nation.

The Bureau of Reclamation has not stopped on the Snettisham project at the point providing for this immediately foreseeable powerload. We expect that other industrial developments will be attracted to the

Juneau area by its vast natural resources if those industries can be assured of power for their operation. Therefore, we are proceeding with investigations of additional power developments which can operate in conjunction with the Crater-Long Lakes division of the Snettisham project, to provide even more efficient and more abundant power. We have already looked into the possibilities of tapping Lake Dorothy and consider it to be a favorable small project which will fit well into the Snettisham project and transmit power over the same distribution system.

Our field forces are presently studying the Speel River division of the Snettisham project, and the report on that potential development is expected to be released in about 2 years.

In closing I should mention the potential for a very large hydroelectric project by virtue of the headwaters of the Yukon River being adjacent to the southeastern Alaska coast. Possibly as much as 2½ million kilowatts of low-cost prime power could be generated by diverting the headwaters of the upper Yukon River system through tunnels to tidewater at Taiya Inlet near Skagway. The Bureau of Reclamation studied this possibility a number of years ago but international complications and the absence of foreseeable power markets influenced us to defer consideration of this project at the present time.

Now in dealing with the Snettisham project and the industrial growth of Alaska, I don't really think it is difficult to determine which comes first, the chicken or the egg. I think the Snettisham project is the chicken, I think it can lay the egg that can be hatched into the industrial development that this area needs. I seriously doubt, however, that as a Federal project it will receive endorsement until there is definite assurance that someone will build the incubator in which to hatch the egg and put the product into actual work in industrial development. So I consider it quite essential that we have a definite commitment from the Georgia-Pacific Alaska Co. to take a large block of this power for industrial development or a commitment from possibly a company interested in developing the iron ore in the Snettisham area, and I doubt seriously, Mr. Chairman, that it can be successfully inaugurated as a Federal project without those definite assurances.

I would now like to have Mr. Daryl Roberts give some details as to the costs, the type of estimates planned from an engineering point of view and the time of construction that would be involved.

Senator GRUENING. Thank you very much, Commissioner. Before Mr. Roberts comes on, I would like to ask you one or two questions. In what other cases of dams, power projects, constructed by the Bureau of Reclamation has local financing been sought and obtained?

Commissioner DOMINY. I'm not sure I understood your question.

QUESTIONS AS TO LOCAL FINANCING

Senator GRUENING. Well, as I understood you to interpret the prospective planning of the Bureau of the Budget, that the Bureau of the Budget urged that local financing be sought prior to an attempt to get Federal authorization. Have you in your experience as Commissioner known of other projects by the Bureau, and, if so, which ones, in which local financing, private financing, was sought and obtained?

Commissioner DOMINY. Well as a matter of fact, Mr. Chairman, normally projects are not considered by a Federal agency, if in the judgment of the Federal agency, local financing can develop them without the aid of the Federal Government. It is normally the expensive projects that require a large initial outlay that are beyond the reach of private-risk capital or State or local municipal bonding abilities that are undertaken as a Federal project. This being small in relation to the average Federal undertaking, I think that is the reason the Bureau of the Budget asked that in this case they be assured that it could not be undertaken through local financing.

Senator GRUENING. Well, have there been any projects anywhere in the United States developed by the Bureau of Reclamation in which Federal financing has not been granted but private financing has been secured? Do you know of any such?

Commissioner DOMINY. Well, I don't know of any project that we have recommended for authorization that was actually constructed through private financing; no, sir. But there are many projects of this size—of course, hydro projects—that have been developed by private financing in the States.

Senator GRUENING. Could you name them?

Commissioner DOMINY. Oh, the Pacific Gas & Electric Co. of California has many hydroprojects of this size and character.

Senator GRUENING. And the financing of those cases were entirely from private sources?

Commissioner DOMINY. The Federal Government wasn't involved directly in financing them, sir.

Senator GRUENING. Then in those cases the part of the Bureau of Reclamation was merely to design and build the projects?

Commissioner DOMINY. No; we didn't design or build them in those instances. I say that no case do I know of that a project, that has been recommended in the past for construction by the Bureau of Reclamation, was constructed by private financing. I don't know of any in that category. I know of a lot of projects of a size comparable to the size of Snettisham that have been built by private financing. They were not designed by the Bureau, they were not engineered by the Bureau, not constructed by the Bureau.

Senator GRUENING. Well, then, aren't we facing a unique and unprecedented recommendation by the Bureau of the Budget when the Bureau says:

> Bureau of Reclamation has built and designed this project but we want it to be financed privately before we will consider it.

Commissioner DOMINY. I think that is your misunderstanding of the Bureau of the Budget's statement. They are merely saying that before the Congress authorizes the project for Federal construction the Bureau of the Budget is suggesting that all efforts be explored to finance it other than by the Federal Government.

Senator GRUENING. Well, is the recommendation of the Bureau of the Budget conditional upon our getting private financing?

Commissioner DOMINY. Not as I understand it.

Senator GRUENING. I suspect that private financing here of a project involving $40 million would be extremely difficult, perhaps impossible to get.

Commissioner DOMINY. I agree and that is why I said a moment ago that I felt quite confident that facts would support a statement that private financing is not available in this area for this purpose.

Senator GRUENING. Do I understand you to say that you believe that we should not go ahead and seek authorization unless and until we have a firm commitment from an additional and substantial power user? That despite the fact that the testimony shows that this community is going to be extremely short of power in the immediate future and even more short before such a project could be completed, that we should not attempt to get authorization for the community's needs?

Commissioner DOMINY. Well, bear in mind, Mr. Chairman, that same testimony from Mr. Nagel indicated that Snettisham power would be higher cost than alternative sources if you were relying strictly on domestic use and regular municipal growth and development. Absent the impact of major industrial additions to the economy.

Senator GRUENING. Well, would it not be reasonable to assume—in view of the fact that it would take 4 years to construct the project, more or less, after authorization and appropriation both of which you know from your experience in Washington, might take a year or two—that we could assume that in that period of time additional power markets would be found and that we would be well advised to risk that situation and go ahead rather than face a more drastic shortage?

Commissioner DOMINY. I think there could be arguments in support of that, sir, if there were existing entities that would undertake the responsibility of paying the cost of the Snettisham project. But if it runs as high as 30 mills in the absence of the industrial load, I think the community would be ill advised to give such assurances.

Senator GRUENING. Well, I would certainly seek before the conclusion of this hearing the testimony of the mayor of Juneau and the mayor of Douglas and the people on the Glacier Highway, as to whether they would be willing to risk a 30-mill cost for a year or two after 1965. On the assumption that there would be no additional power user—I don't want to speak for them, but I think their testimany on that subject would be pertinent and I shall certainly try to get it for the record.

However, you would not recommend proceeding with the project unless we got additional power users, such as Georgia-Pacific or a mining operation that would use a large block of power, is that correct?

Commissioner DOMINY. The chairman well understands the process of getting a project authorized through Federal channels. The Commissioner of Reclamation is responsible for the economic and engineering program and development of a report. That report is reviewed and if accepted is endorsed by the Secretary of the Interior. He, in turn, seeks the judgement of the Bureau of the Budget as to the position of the administration on the particular proposal. As I understand it, the Bureau of the Budget has authorized submittal of the report to Congress, conditioned upon the firm contracting of the power to be made available by the Snettisham project to assure its repayment with interest, over a 50-year repayment period.

Senator GRUENING. Do you know, Mr. Commissioner, whether when President Roosevelt authorized Grand Coulee Dam there was a firm assurance that the power that would be generated there would be used?

Was there a commitment of the kind that would seem to be required in this instance?

Commissioner DOMINY. I'm quite sure there was not, Mr. Chairman. Grand Coulee was not authorized and constructed in a period of normal economic prosperity in the Nation. It was initiated as a PWA-type project and was so identified. The conditions were far different when the undertaking of the Grand Coulee was approved insofar as the economy of the United States was concerned, than prevails now.

Senator GRUENING. But the Government at that time went ahead without any of the firm commitments for the use of power of the kind that would seem to be required for the Snettisham project and this administration.

Commissioner DOMINY. That's right, the Federal Government in a sense undertook the underwriting of that project without the assurance of repayment, that would be involved on the Snettisham type of authorization.

Senator GRUENING. But the power market was found nevertheless, was it not?

Commissioner DOMINY. It was, it was indeed.

Senator GRUENING. In fact, in excess of the power production.

Commissioner DOMINY. Well, in the Pacific Northwest there had been a great deal of private development and additional Federal development supplementing the Grand Coulee project since that time. I think it can be said that the Pacific Northwest powerload has been met substantially as the load developed.

Senator GRUENING. Well, would it not be possible to conceive that this administration might have a similar conclusion about the development of this area and be willing to risk an endorsement of this project, on the assumption that these other projects would come as in the case of Grand Coulee?

Commissioner DOMINY. It's entirely possible that after the debate before the committees of Congress that such a conclusion could be arrived at; yes, sir.

Senator GRUENING. Well, of course, the recommendation of the department concerned is always a vital factor as you know. Thank you very much Mr. Commissioner and we will be very glad to hear from Mr. Roberts on the project itself.

STATEMENT OF DARYL ROBERTS, DISTRICT MANAGER, BUREAU OF RECLAMATION

Mr. ROBERTS. My name is Daryl Roberts, I am the district manager for the Bureau of Reclamation for Alaska Investigations. I would like to cover some of the features of the Snettisham project. The project construction costs are estimated to be $38,400,000. The construction period will be approximately 3½ years; that is, from the time we receive construction appropriations.

Now I would like to go to the board and present a schematic drawing showing the general plan for the project and go through some of the features with you. [Pointing.] Here we have Crater Lake; here we have Long Lake. The plan is to excavate a tunnel from Crater Lake over here, to a surge tank, and construct an underground penstock into the powerplant. The same development would be applied to

Long Lake. The tunnel from Long Lake would be 8,175 feet long, and it would be 9½ feet in diameter. That would be the finished diameter of the lined tunnel. The tunnel from Crater Lake would be 6,150 feet in length. It would be a lined tunnel with a 7-foot diameter. These tunnels would enter the surge tanks here [indicating], which would be 20 feet in diameter. The Long surge tanks would have a height of 275 feet and the Crater surge tanks would have a height of 270 feet. These surge tanks would be connected to underground steel penstocks, as I previously mentioned. The Long tunnel penstock would be 7½ feet in diameter and the Crater penstock would have a 6-foot diameter. Both penstocks would enter the powerhouse here. There would be an installed capacity of 48,000 kilowatts. Adjacent to the powerhouse would be a switchyard with a capacity of 60,000 kilovolt-amperes. It would be necessary to dredge out a small tailrace channel in order to take advantage of maximum head. Under fluctuating tidal conditions..

Now up here, you see a tunnel starting in Long Lake. This tunnel takes off with an elevation of 625, the lake has an elevation of 813. Over here on Crater, we have a tunnel elevation of 800, and the lake has a water surface of 1,022. This presents a unique problem in tapping these lakes. Although this has been done many times before, each project presents a little different problem. However, this is something that is quite feasible. From the powerhouse—which would be at this point on this other map—we carry 115-kilovolt lines down the Speel River, over the mountain, across Taku Inlet with 2.7 miles of submarine cable and then overland to Juneau.

The transmission line will consist of 10.4 miles of steel tower structure—that will be this first part—the rest of it will be wood pole with the exception of the submarine cable.

The substations will be located within the neighborhood of the city limits of Juneau. The voltage on the line will be 150 kilovolt. We would provide only one switchyard under the present thinking and one substation. The substation of course, would be at Juneau and it would be automatically operated. We would have a telemetering arrangement whereby personnel in Juneau would operate the plant at Snettisham. We plan to have only three men possibly for general maintenance and in that way we can cut down on considerable cost. The transmission line will be very difficult to construct as it is very steep terrain. We were over it yesterday and the mountains come straight down into the water, so some of the line is going to be real hard to shelter. It is planned to use helicopters to install these transmission systems through here. There will be no problem of access on the other portions.

This development can be a year-round job. In other words, the penstock tunnels are underground, the diversion tunnels are underground, the only surface work would be the powerplant and with that type of development this program could be greatly accelerated. The parts of the project could be developed independently and thereby the schedule could be stepped up considerably, if such was necessary. However, we will require about 3½ years—we think that is ample time and we do feel that this schedule could be expedited if it became necessary. So that it would be possible to get power on the line within the third construction year.

I believe that covers the project generally unless there are some special questions.

Senator GRUENING. Thank you very much Mr. Roberts.

Mr. Holdsworth, have you any questions of Mr. Roberts on this?

Mr. HOLDSWORTH. No, I don't believe so.

Commissioner DOMINY. Mr. Chairman, I think that we should ask Mr. Roberts to indicate our estimate of the cost of the power under what load factor.

Mr. ROBERTS. The cost of the power delivered in Juneau is estimated to be 6.1 mills and the load factor is 66 percent.

Commissioner DOMINY. Well, are you in general agreement Mr. Roberts, with the statements made here today as to the very high cost for the Snettisham project power, if that project were to be utilized merely to supply the present load growth pattern as indicated by Mr. Nagel?

Mr. ROBERTS. No doubt it would be high. There again, if it turned out that the load was going to be delayed in building up the project could be developed as a partial installation. However, we don't recommend it because there would be a greater overall cost in doing it.

Senator GRUENING. Mr. Roberts, taking the figure that Mr. Nagel presented of increased costs and relating that with the fact that it would take 3½ years to build this project after you got the money—which I think that it would be reasonable to assume you could not get before the 2d session of the 87th Congress. Would you supply for the record a table of what the costs would be during that period assuming such annual growth? In other words, if you start with an assumption that it would cost 30 mills, certainly that price would decrease with each passing year, would it not?

Mr. ROBERTS. In developing our payout study we determine an average cost over a period of 50 years, and that would be the price that we would have to come up with for repayment. It wouldn't be 30 mills for this year and something for the next one. It would be an average rate over the payout period of 50 years, whatever it would take, and that would be arrived at by determining when the project would have ultimate use.

Senator GRUENING. Has the Bureau of Reclamation made any estimate of the amount of power which Georgia-Pacific would use if it decided to go ahead with its option and whether the power generated by the present Crater-Long Lakes project would be sufficient for that and for the Juneau area needs?

Mr. ROBERTS. Mr. Chairman, we have some indications from Georgia-Pacific that they would require 230 million kilowatt-hours annually for opeartion of a newsprint mill and that was what our study was predicated on. Concerning installed capacity, they would require 30,000 kilowattts of which their firm need would be 27,000 kilowatts.

Commissioner DOMINY. So you can see Mr. Chairman, that 48,000 kilowatts that is proposed in the Bureau Snettisham project, would not only provide the power requirements of the proposed pulpmill, but would provide for the load growth as predicted for this area for a number of years.

Senator GRUENING. Thank you very much Mr. Roberts.

I have a letter here from President Buckley of the Georgia-Pacific-Alaska Co. He was invited to attend the hearing but was unable to

do so because of a previous committment, and he said that that was likewise true of other qualified representatives of the company. It is a nine page letter, but in view of the fact that it will be the basis of other questions which I think should be in the record I find it necessary to read this, and I think also that those present would like to hear it.

This letter is dated September 9, from the office of the Georgia-Pacific-Alaska Co. in the Equitable Building at Portland, Oreg.

LETTER FROM GEORGIA-PACIFIC ALASKA CO.

GEORGIA-PACIFIC ALASKA CO.,
Portland, Oreg., September 9, 1960.

Subject: Snettisham project, Crater-Long Lakes division, Juneau, Alaska.

Hon. ERNEST GRUENING,
Acting Chairman, Subcommittee for Irrigation and Reclamation,
Federal Building, Juneau, Alaska.

DEAR SIR: On behalf of Georgia-Pacific Alaska Co., this letter is submitted to you, as chairman of the Subcommittee for Irrigation and Reclamation (U.S. Senate Committee on Interior and Insular Affairs), to state the interest of Georgia-Pacific Alaska Co. with respect to the proposed legislation to authorize construction of Crater-Long Lakes division of the Snettisham project near Juneau, Alaska.

In connection with the hearing on Juneau area power requirements and resources, now scheduled by the subcommittee for September 15 and 16 at Juneau, Alaska, we respectfully request consideration of the following facts and inclusion of this letter in the record of the hearings.

I. INTEREST OF GEORGIA-PACIFIC ALASKA CO. IN PROPOSED NEWSPRINT PULPMILL ENTERPRISE IN JUNEAU AREA

Georgia-Pacific Alaska Co. has now and has had for several years a continuing definite interest in constructing a newsprint pulpmill in the Juneau area.

The most important factor which has caused Georgia-Pacific Alaska Co. to defer final action with respect to its proposed construction of a newsprint pulpmill in the Juneau area has been the unavailability of power.

Should the Crater-Long Lakes division of the Snettisham project be authorized and Snettisham project power be made available at approximately 6 mills, the deterrent factor of unavailability of power would be removed.

In order to acquaint the subcommittee with the background of our proposed Juneau industrial development, we submit the following summary of the preparations which have been made and the action which has been taken and is being taken by Georgia-Pacific Alaska Co. in connection with the proposed Juneau newsprint pulpmill enterprise.

II. PRELIMINARY AWARD OF TIMBER

August 17, 1955, preliminary award of 7,500 million feet, board measure, of timber in the Juneau unit of the Tongass National Forest in southeastern Alaska was made by the Forest Service, U.S. Department of Agriculture, to Georgia-Pacific Alaska Co., highest qualified and sole bidder at the oral auction held on that date at Juneau, Alaska. Georgia-Pacific Alaska Co. thereupon made the additional deposit as required of the successful bidder by the terms and conditions of the sale.

III. TIME FOR QUALIFICATION FOR FINAL AWARD OF TIMBER

July 1, 1961 is the final date for Georgia-Pacific Alaska Co. to qualify for final award of the Juneau pulp timber unit.

IV. TIME WITHIN WHICH TO CONSTRUCT PULPMILL AND RELATED FACILITIES

In the event Georgia-Pacific Alaska Co. qualifies for final award of the Juneau unit timber, it will be obligated, on or prior to July 1, 1964, to install in or adjacent to the sale area described in the proposed timber sale contract,

Tongass National Forest, Juneau unit, a mill or mills for the manufacture of pulp which, together with such additional associated facilities as Georgia-Pacific Alaska Co. may find desirable to install, shall have an initial annual log requirement of at least 100 million board-feet.

V. CONTEMPLATED PERMANENT OPERATION OF THE JUNEAU UNIT PULPMILL ENTERPRISE

The proposed timber sale contract for the Juneau pulp timber unit provides for removal of the contract timber at the rate of an average annual cut of approximately 150 million board-feet over a period extending to December 31, 2010.

In addition thereto, the proposed timber sale contract expressly sets forth the intention that the Juneau unit pulpmill enterprise will be conducted on a competitive and commercially sound basis and that, through sustained yield management of the timber resources of the Tongass National Forest, opportunities will be afforded by the Forest Service for purchase of supplies of timber for permanent operation of the enterprise, up to an average annual log requirement of 160 million board-feet.

VI. EXPENDITURES BY GEORGIA-PACIFIC ALASKA CO. FOR ESSENTIAL SURVEYS, DESIGNS, AND PLANS IN CONNECTION WITH THE JUNEAU UNIT PULPMILL ENTERPRISE

Georgia-Pacific Alaska Co. has made substantial expenditures in connection with the Juneau unit pulpmill enterprise in causing to be made the essential surveys, designs, and plans which have been undertaken and are now in progress. Expenditures have been made during each of the years 1953 to 1960, inclusive. The total of these expenditures is in excess of $500,000.

VII. PURCHASE OF MILLSITE

After survey of several alternate millsites and consideration of suitability for various plans and designs contemplated, 74.09 acres on Douglas Island have been purchased.

VIII. ESSENTIAL SURVEYS, DESIGNS, AND PLANS IN CONNECTION WITH THE JUNEAU UNIT PULPMILL ENTERPRISE

Among the essential surveys, designs and plans which have been undertaken and are continuing are—

A. Water surveys, including water supply and effluent disposal.

B. Economic and technological surveys on various essential subjects, including (1) world markets, (2) demand-supply estimations, (3) power, (4) labor supply, and (5) transportation rates.

C. Report on cost of 500-ton-per-day newsprint pulpmill.

D. Plans for development of Juneau unit enterprise, including logging plans, improvements, site development, plant construction, study and evaluation of various surveys, etc.

E. Plans for lumber mills and plywood plants.

F. Intensive quality samplings, surveys, and cruises of the timber in the sale area on Admiralty Island (completed during the summer of 1960).

G. Examination of available Forest Service and other data with respect to lumber recoveries, log grades, and estimates of log production and consumption in southeastern Alaska.

H. Economic surveys of comparable enterprises in southeastern Alaska.

IX. POWER PROBLEM

Sufficient power from steam or hydroelectric sources is not available in the Juneau area for operation of the contemplated newsprint pulpmill. Newsprint requires enormous quantities of power and, in the case of the proposed mill, power requirements will be approximately 30,000 kilovolt-amperes (kilowatts) when the initial stage of the mill has been constructed and put into operation, at an estimated capacity of two-thirds maximum potential. Expansion of the initial stage to full capacity could be estimated at 40,000 kilovolt-amperes by 1970, and the probable addition of adjacent dependent industry and population increase could be estimated to expand power requirements to 50,000 kilovolt-

amperes by 1980. The initial power requirement of 30,000 kilovolt-amperes (with an indicated annual load factor of 90 percent) would necessitate a block of power of about 230 million kilowatt-hours annually.

At the present it appears that Georgia Pacific Alaska Co. will have to rely on the Snettisham project or a project similar thereto for power, so that if such project does not go ahead or if it is delayed our plans, too, might be delayed or terminated completely.

X. FACTORS AFFECTING FINAL DECISION

There are many factors to be considered by Georgia-Pacific Alaska Co. preliminary to making a final decision as to whether or not it will construct a newsprint pulp mill in the Juneau area.

As noted previously, the most important single factor which has caused Georgia-Pacific Alaska Co. to defer final action with respect to the Juneau newsprint pulp mill enterprise has been the unavailability of low-cost power.

Contemplated Snettisham project power available to Georgia-Pacific Alaska Co. at approximately 6 mills would satisfy the power requirement of Georgia-Pacific Alaska Co. and thereby remove the deterrent of unavailability of power.

The "final award" by the U.S. Forest Service to Georgia-Pacific Alaska Co. of the timber sale contract and the performance dates thereunder would, of necessity, have to be timed as nearly as practicable to the completion of the Crater-Long Lakes division of the Snettisham project.

XI. CONCLUSION

Georgia-Pacific Alaska Co., through its continuing interest in construction of the Juneau newsprint pulp mill enterprise, has become and is vitally concerned with the proposed development of the power resources of the Juneau area.

We urge that this subcommittee recommend that the Congress authorize the proposed Crater-Long Lakes division of the Snettisham project.

We will be glad to furnish, upon request, any additional information desired by the subcommittee.

Very truly yours,

GEORGIA-PACIFIC ALASKA CO.,
J. L. BUCKLEY, *President.*

Senator GRUENING. Of course the additional information that the committee would require is whether they are going to sign up, and that seems to be lacking.

Now we have an extraordinary situation here. The Federal agencies, the Bureau of Reclamation, speaking for the Bureau of the Budget, and the Department of the Interior, say we can't go ahead unless we have the assurance of some customer such as Georgia-Pacific. Georgia-Pacific on the other hand, says it cannot go ahead unless it has assurance that this Snettisham will be constructed. Now those two propositions are utterly contradictory and incompatible, and I commend that observation to the consideration of the Commissioner and to the Department.

I think that we should next hear from the Forest Service on this matter. The Forest Service has been working on this project, and we are confronted with this dilemma which is very obvious. The question we will have to find out is whether in the event Congress authorizes this project, Georgia-Pacific would agree to make a firm commitment. I do not know whether it is possible for the Department to make a recommendation on that assumption.

Commissioner DOMINY. The Budget Bureau's position was that the authorization language be such as to require the agreement for taking the power and assuming the payout prior to construction, not prior to authorization. This being so, as I understand the letter, they indicate strong interest if the Snettisham project can be built at a schedule that will fit into their commitments with the Forest Service; that if

it all can be correlated, that they are prepared to go ahead. If that is true, I would think such a provision in the authorization act would be no real deterrent to the construction of the Snettisham project.

Senator GRUENING. Well then, you would say Mr. Commissioner, that the administration to the extent that you feel you could speak for it, would endorse a project with this condition written into the authorization that this customer or some similar customer would be there to take this power.

Commissioner DOMINY. That is my understanding of the administration's position as stated by the Bureau of the Budget.

Senator GRUENING. Thank you very much, Mr. Commissioner.

Mr. Peter Hanson, who is the area director of the U.S. Forest Service, is obliged to be in Sitka today to take care of the visiting forestry experts from various countries. Mr. John L. Emerson, assistant regional forester, is here. Mr. Emerson, we are very happy to have your testimony. Anything you care to say and any comments that you care to make on the Georgia-Pacific-Alaska Co. matter will be welcomed.

STATEMENT OF JOHN L. EMERSON, ASSISTANT REGIONAL FORESTER, U.S. FOREST SERVICE

Mr. EMERSON. Mr. Chairman, I would like to express to you Mr. Hanson's regret at not being able to be here today. I have a short statement.

Mr. Chairman, I am glad to respond to you and your request of August 26, 1960, that the Forest Service be represented at this hearing and present a statement relating to special authorization of construction, operation, and maintenance of the Crater-Long Lakes division of the Snettisham project.

The Department of Agriculture has not taken a position on S. 3095, and the following statement is not intended to be an endorsement for or an objection to the enactment of S. 3095.

S. 3095 would authorize the Secretary of the Interior to construct, operate, and maintain the Crater-Long Lakes division of the Snettisham project near Juneau, Alaska, for the principal purpose of developing hydroelectric power to encourage and promote the economic development of and to foster the establishment of essential industries in the State of Alaska.

The proposed project, as described in the feasibility report of the Bureau of Reclamation of July 1959, would be almost entirely on national forest lands and could be carried out with important favorable results and negligible adverse effects upon national forest resources and uses. The project could bring about or hasten the establishment of a major industry in the Juneau area for the sustained yield harvest of extensive timber stands from nearby national forest lands. Such industrial development would permit materially improved management of national forest timber, with reduced losses from insects and disease.

Preliminary award of a 50-year contract of sale for 7½ billion board feet of national forest timber near Juneau has been made to the Georgia-Pacific-Alaska Co. If the Georgia-Pacific-Alaska Co. qualifies for final award and such award is made, the construction

of a large, permanent pulpmill (or mills) with associated facilities will be required by July 1, 1964.

Large quantities of firm power would be necessary for the operation of a pulpmill installation. The area's existing power supply is wholly inadequate to meet such needs. The Georgia-Pacific-Alaska Co. has indicated that the unavailability of adequate low-cost power has been and is an important deterrent to qualification for the final award of the timber sale contract and the construction of a pulpmill. The proposed project could satisfy requirements and also meet the needs of Federal agencies, public bodies, and cooperatives. The Forest Service is not in a position to determine whether the proposed project would best meet this need.

Economic feasibility of the Bureau of Reclamation's proposed project is contingent upon the establishment of a substantial industrial load in the Juneau area. By the same token the establishment of a newsprint pulp industry is dependent on the assurance that power will be available. Power will need to be developed by mid-1964 to meet the requirements of the prospective pulpmill.

Senator GRUENING. Mr. Emerson, these statements indicate that the Department of Agriculture has not taken any position on Senate bill 3095, which I introduced in the 86th Congress. Do I understand that the Department of Agriculture was not asked for a report by the Department of the Interior on this project?

Mr. EMERSON. I understand they have been asked for a report and the report is being prepared. All I know is they have not made a final report, or taken a definite position.

Senator GRUENING. I think it would be appropriate to introduce the bill at this point of the record. Of course, the bill did not include the conditional requirement which we have just discussed. It provides that the Secretary of the Interior be authorized to go ahead and construct the project, provided a customer such as Georgia-Pacific were available and subject to any changing conditions which may take place. I propose to introduce such a bill again in the 87th Congress with such changes as may be required by the circumstances which have been brought out in the hearing. Of course, we do not know exactly what this administration may do and what the next administration may do. They may not see eye to eye on this project, although I think there is a pretty general agreement on the part of all concerned that this is a desirable project, that the newsprint mill is desirable, that the area needs this power, and, if it is humanly possible, we should reconcile all these differences and try to proceed. I assume that as the Forest Service has negotiated this arrangement with the Georgia-Pacific that would be its view also. I think that is a reasonable assumption. Do you not say so, Mr. Emerson?

Mr. EMERSON. I certainly am not in the position to commit the Department.

Senator GRUENING. No, I realize that none of us are in a position to commit either the departments or the Congress. Would you feel free to give any opinion, personal or otherwise, on whether you think Georgia-Pacific would go ahead if we authorized this project?

Mr. EMERSON. We have no more information than what you have in that letter that you just read.

Senator GRUENING. Well, that letter doesn't say anything in nine pages.

Mr. EMERSON. In other words we don't have any new information whatsoever as to their intentions.

Senator GRUENING. Well, we must then hope that they will either go ahead or the Forest Service will get busy and secure another prospect.

Mr. EMERSON. They have, of course, until next July 1 to comply.

Senator GRUENING. I would hope the Forest Service would not wait until the last minute before surveying other prospects and possibilities.

Thank you very much, Mr. Emerson.

Commissioner Dominy?

Commissioner DOMINY. I would like to say just this: That the material which is being transmitted up to Congress does contain letters from all of the Federal agencies and the report has been reviewed and none of the reports were negative in character as to the desirability of the Snettisham project.

Senator GRUENING. Thank you, Commissioner. All of these reports will be included in the record of the hearings.

(The text of S. 3095, 86th Cong., sponsored by Senators Gruening, and Bartlett, is as follows:)

[S. 3095, 86th Cong., 2d sess.]

A BILL To authorize the construction, operation, and maintenance of the Crater-Long Lakes division of the Snettisham project, Alaska, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, for the principal purpose of developing hydroelectric power in order to encourage and promote the economic development of and to foster the establishment of essential industries in the State of Alaska, and for other purposes, the Secretary of the Interior is authorized to construct, operate, and maintain the Crater-Long Lakes division of the Snettisham project near Juneau, Alaska. The works of the division shall consist of pressure tunnels, surge tanks, penstocks, a powerplant, transmission facilities, and related facilities.

SEC. 2. Electric power and energy generated at the division, except that portion required in the operation of the division, shall be disposed of in such manner as to produce revenues sufficient to recover all costs of producing and transmitting the power and energy, including the amortization of the capital investment over a period of not to exceed fifty years, with interest at the average rate (which rate shall be certified by the Secretary of the Treasury) paid by the United States on its marketable long-term securities outstanding on the date of this Act and adjusted to the nearest one-eighth of 1 per centum. In the sale of such power and energy, preference shall be given to Federal agencies, public bodies, and cooperatives. It shall be a condition of every contract made under this Act for the sale of power and energy that the purchaser, if it be a purchaser for resale, will deliver power and energy to Federal agencies or facilities thereof within its transmission area at a reasonable charge for the use of its transmission facilities. All receipts from the transmission and sale of electric power and energy generated at said division shall be covered into the Treasury of the United States to the credit of miscellaneous receipts.

SEC. 3. The Secretary is authorized to perform any and all acts and enter into such agreements as may be appropriate for the purpose of carrying the provisions of this Act into full force and effect, including the acquisition of rights and property, and the Secretary, when an appropriation shall have been made for the commencement of construction or operation and maintenance of said division, may, in connection with the construction or operation and maintenance of such division, enter into contracts for miscellaneous services for materials and supplies, as well as for construction, which may cover such periods of time as the Secretary may consider necessary but in which the liability of the United States shall be contingent upon appropriations being made therefor.

SEC. 4. There are hereby authorized to be appropriated such sums as may be required to carry out the provisions of this Act.

Senator GRUENING. We have a representative here from the Glacier Highway Electric Association. He is Mr. William T. Dunn. Mr. Dunn, would you be kind enough to come forward and present your testimony?

STATEMENT OF WILLIAM T. DUNN, TREASURER, GLACIER HIGHWAY ELECTRIC ASSOCIATION

Mr. DUNN. I am William T. Dunn. Among my capacities is that of treasurer of the Glacier Highway Electric Association, which is a small cooperative, operating a 20.71-mile transmission line at Auke Bay and the surrounding area, and buying our power through the Alaska Electric Light & Power Co. As this hearing is going into detail with testimony from many people who are intimately familiar with all of the ramifications of Snettisham, our statement will simply be a reading of a motion which was put through at our meeting of Thursday, April 21, 1960. This is the original copy of our minutes:

The motion was made by Mr. William T. Dunn that the GHEA go on record that the letter to Senator Gruening, Senator Bartlett, and Congressman Rivers, in which we heartily endorse the Snettisham power project as being vitally and urgently needed because the needs in our vicinity are going to increase as much as 10 percent a year.

And further, Mr. Chairman, a little rundown on the actual figures covered in a letter written by our president, Mr. Kenneth Smith, to the Honorable Ernest Gruening, U.S. Senator, states that over the past few years there has been an average demand increase of 12.63 percent at our substation. Our little residential community out there has increased its usage each year the past several years by 12.63, and that too is a cumulative increase each year, 12.63 over the year before.

We do not have any expert information to give the committee, but the GHEA out at Auke Bay, which is a very marvelous little residential community—growing each year—would like to go on record before this committee as unreservedly in favor of the Snettisham development at the earliest possible moment. Thank you.

Senator GRUENING. Thank you very much Mr. Dunn. Your cooperative not only has increasing growth due to new people coming into your area, but you have plans, do you not, for extending your powerlines further northward when the demand warrants?

Mr. DUNN. Yes, Mr. Chairman, we have extended our lines as consumers require and as the economics source supplying it permit. We are anxious to extend our lines within our service area to every house that could use electricity.

As I mentioned, we now operate 20.7 miles of transmission lines and our customer growth has been very satisfactory over the years. Right at the present time we have well over 300 customers on our lines and the prospects based upon a considered review at what happened the last 6 or 7 years will indicate that we can look forward, not only to continued growth, but to even faster growth because of the various attractions of the Auke Bay area on which I will not make a chamber of commerce speech.

Senator GRUENING. Well, we are in accord with that view, even though we do not represent the chamber of commerce. Would it be possible for you to supply for the record a brief history of the cooperative? The time of its initiation, the number of customers it began with

and the growth through the years, ending up with the present number of customers and the approximate consumption. Would those figures be available without too much difficulty?

Mr. DUNN. Mr. Chairman, we could and we would be very happy to supply the committee with that within a day or two. I could give the committee a verbal rundown if they wish at this time.

Senator GRUENING. Well, the record will be kept open and there will be no problem there. We would like to have it as authoritative and correct as possible, so that the full committee may estimate what the potentials are outside of the city of Juneau and the city of Douglas. We hope to have a statement from the city of Douglas before this record is closed also.

Mr. DUNN. I take it then, Mr. Chairman, that you would rather have that in a form of a written statement?

Senator GRUENING. I think that would be preferable if that is agreeable to you. Thank you very much, Mr. Dunn.

(The following communication was subsequently submitted:)

GLACIER HIGHWAY ELECTRIC ASSOCIATION, INC.,
Auke Bay, Alaska, November 14, 1960.

Subject: Senate Subcommittee/Power hearings in Alaska.

Hon. ERNEST GRUENING,
Senator from the State of Alaska,
Senate Office Building, Washington, D.C.

DEAR SENATOR: In compliance with your request at above hearing held at Juneau, for the historical background of Glacier Highway Electric Association, Inc., the following may be of interest to both yourself and committee.

Glacier Highway Electric Association, Inc., was born of dire necessity. In the late nineteen thirties, the area now covered by the project had developed to the point where lack of central power service constituted a major disadvantage. Local residents tried, by all available means at their command, to induce the local private utility to extend its services to the established homes and stores on the shores of Auke Bay and, if possible, to Tee Harbour. The answer was the old, old story. Not enough consumers and not enough revenue in sight to justify the investment. This in spite of the area's willingness and ability to underwrite a very substantial portion of the proposed project. After two or three serious attempts, the war years intervened.

With termination of the worldwide conflict, those of our boys who were not called upon to make the supreme sacrifice returned home. New homes were built and the somewhat enlarged community again faced the bleak prospect of no adequate power supply.

Fortunately, Rural Electrification Administration began to evince some interest in the Territory of Alaska at this point. Again the local residents banded together and sought relief from the vexing problem. A loan was secured from REA, in the amount of $230,000, and work begun in the spring of 1948.

A year was required to complete the major parts of the system. On June 19, 1949, power was turned on for the immediate use of some 20 consumers then ready for service.

In spite of the difficulties inexorably associated with new enterprises, Glacier Highway Electric Association has managed to survive and to serve its member-consumers. However, the complete objective is not only service, but service at a price comparable to the established level of the surrounding area. This is not being done in the present case. Future success depends upon the availability of a block of power at reasonable cost. Development of a modern generation source with its attendant economies would satisfy the need which is becoming more difficult to bear with the passing days.

For the information of the committee and all other interested parties, we enclose two copies of our published rates. Please remember the following points in connection with said rate schedules.

1. There is presently a 5 percent or $1 dollar per month surcharge levied upon each account, in addition to the base rate.

2. All power is purchased by Glacier Highway Electric Association, Inc., at 2¼ cents per kilowatt-hour, regardless of quantity.

It can readily be seen that the above peculiar circumstance could prove fatal to the enterprise with the advent of larger demand for service. The very thin margin resulting from sales on a sliding scale as against a fixed cost per kilowatt-hour has a definite point of no return.

Cordially yours,

WM. T. DUNN, *Treasurer.*

Senator GRUENING. Now is there anyone here who wishes to testify further on the needs of this area, because if not we will suspend this part of the record and move to others.

Mr. Mayor Parker, of Juneau.

FURTHER STATEMENT OF MAYOR PARKER

Mayor PARKER. Senator, I am at a bit of a loss upon what to say to the council this evening on this customer situation, and if I may ask some questions—just one or two—I would like to clear up this point.

Mr. Dominy, you and I discussed this matter before of preference customer, and as Mr. Dominy states, we are going to use this word "customer" again in establishing the criteria for passing this bill and going ahead with the project. Now who can this customer be? I was told when I was in Washington that our chances of ever getting a bill through Congress that was specifically for private enterprise or when the main block of power was specifically for private enterprise were very, very, slim. Now then we in turn tried to couch this outlook by using a governmental agency or governmental entity as a preference customer. We haven't worked that one out yet and I am at a bit of a loss as to just how we are going to work this out. I've got to tell the council: "Well, this is the way things are set up," so can we explore this a little bit, sir?

Senator GRUENING. I think it would be very desirable to explore it because apparently a preference customer is required, and there seems to be some obscurity surrounding the definition of a preference customer. We communicated with one of the secretaries of the Department of the Interior, and we received an explanation of a preference customer which none of us could understand, and we sought further information and we never received one which was really adequate. I wonder whether the Commissioner of Reclamation could give us some information on that subject?

FURTHER STATEMENT OF COMMISSIONER DOMINY

Commissioner DOMINY. Well, I am very pleased to discuss this again. I have on previous occasions indicated that in my judgment it would be more readily acceptable to the Congress, based on previous experience in getting projects authorized by Congress, if the power were being made available to a preference customer rather than to a private industry direct. However, the Snettisham project report that now has the endorsement of the administration, and is in effect on its way to Congress for consideration, recognizes the facts that exist here.

That is that the biggest load is the potential industrial user and the prime justification for the project is aimed in that direction, with the secondary consideration of meeting of the anticipated domestic and REA load growth in the immediate area. Whether the ghost of preference customer requirement will be raised remains yet to be determined.

Senator GRUENING. I think that at this point the record should include the correspondence between my office and Assistant Secretary Aandahl in the attempt to get a definition of a preference customer. I think that is something we will call upon the Department of the Interior to help us out in drafting this legislation and if however, prior to adjournment of this hearing it would be possible for the Commissioner to enlighten the mayor so that he in turn can speak to the council and tell them what would be required, I think we would make real progress. I think there is a great willingness here to do whatever is necessary provided it can be found out what that something is.

U.S. SENATE,
Washington, D.C., January 30, 1960.

Mr. FLOYD DOMINY,
Commissioner, Bureau of Reclamation,
Department of Interior, Washington, D.C.

DEAR MR. DOMINY: With reference to our discussion concerning the feasibility of authorizing construction of the Snettisham power project at Juneau, a number of questions have occurred to me concerning the criteria which must be met by an agency in order that it may be designated as a "preference customer" for the purposes of marketing power produced and sold by the Bureau of Reclamation. I am aware of the requirement that the preference customer must be a bona fide power agency and that it is not sufficient that it merely serve as a paper agency for marketing purposes.

I am further aware that one of the indicia of the bona fides of a preference customer is the ownership by the agency of the equipment, including generators, transformers and transmission lines necessary to production and distribution of the power.

However, I would like to have considerably more information concerning the criteria by which a preference customer is qualified. For example, it would be useful to know (1) whether there are specialized requirements as to the organization of an agency; (2) the manner in which such groups must be financed; (3) details as to operational standards required; and (4) requirements as to customers who must be served.

Perhaps you could provide me with copies of or citations to legal opinions, legislative materials or other references which would be helpful in clarifying this matter. Any information with which you can provide me will be greatly appreciated.

I wish to take this opportunity to express my appreciation to you for sending me the valuable material concerning the power marketing organization of the State of Nevada and the report on power needs of Alaska. This is very useful, and I am grateful to you for making it available to me.

I shall appreciate your further assistance in providing me with the information concerning preference customers outlined above.

For your information, I am enclosing a copy of a statement I have just received from the Georgia-Pacific Alaska Co. concerning its plans for a newsprint mill in Juneau and its related needs for inexpensive power. I would appreciate receiving your comments on this.

With best wishes, I remain,
Cordially yours,

ERNEST GRUENING.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., February 29, 1960.

Hon. ERNEST GRUENING,
U.S. Senate, Washington, D.C.

DEAR SENATOR GRUENING: This is in reply to your letter of January 30, 1960, to Commissioner Dominy, in which you inquire about the requirement to be met by an agency to be designated a "preference customer" and ask the following questions:

1. Whether there are specialized requirements as to the organization of an agency.

2. The manner in which such groups must be financed.

3. Details as to operational standards required.
4. Requirements as to customers who must be served.

Before responding to the specific questions posed, certain general observations are appropriate.

The broad question of preference customer qualification is one which is not well suited to discussion in generalities and on the basis of hypothetical considerations. Unfortunately, when discussing such a subject in general and hypothetical terms, either question or response is apt to give a misleading impression because one or another theoretical or hypothetical factor may be singled out for emphasis and the subject is then prone to be viewed against a set of limited conditions and qualifications which may have little relationship to actual facts and circumstances as they develop and in the light of which the particular status in fact of a given customer will ultimately have to be determined.

The recognition or designation of an agency as a "preference customer" is not for the purpose of controlling the marketing of power produced and sold by the United States, but is rather to establish the priority of an organization to purchase power from the United States. The indicia of bona fides do not include, per se, ownership of generators, transmission, or other electrical facilities. The statutory purpose, authorities, and responsibilities of the entity largely would be controlling indicia. An agency would not qualify if its broad powers were merely implemented in such a way as to constitute the agency merely as a conduit for the circumvention of the basic purpose for which preference provisions of law were instituted.

With the foregoing in mind, we undertake to respond to your specific questions.

1. There are no specialized requirements as to the organization of an agency as far as the Department of the Interior is concerned. Your State may, however, provide such legal restrictions or control on such an organization, as it considers appropriate.

2. There are no restrictions imposed by the Interior Department on the financing of such groups. There again your State laws may provide such restrictions.

3. There are no specific operational standards required. Such requirements, if any, would be in the light of its intended use and/or disposition of purchased power.

4. In its power sales contracts with preference customers, the Bureau of Reclamation normally does not place restrictions on the customer's subsequent sale of power, so long as such subsequent sales are not obstructive to the objectives which the preference clause seeks.

In regard to the statement which you attached from the Georgia-Pacific Alaska Co., as we understand the situation, the statement expresses the intent the company has conveyed to us on its need for hydropower in the operation of the contemplated newsprint mill. It appears quite evident that the establishment of the proposed mill depends in large part on the availability of low-cost power.

We welcome this opportunity to be of service to you and trust the above discussion will be satisfactory.

Sincerely yours,

FRED G. AANDAHL,
Assistant Secretary of the Interior.

U.S. SENATE,
Washington, D.C., March 4, 1960.

Mr. FRED G. AANDAHL,
Assistant Secretary of the Interior,
U.S. Department of the Interior, Washington, D.C.

DEAR MR. AANDAHL: I am in receipt of your letter of February 29, and I have studied it carefully. I regret to say, however, that I am still uninformed as to the definition of a "preference customer." In view of the fact this may prove to be a matter of considerable importance to the State of Alaska in connection with development of our hydroelectric power resources, I should be grateful if the Department of the Interior could make another effort at giving a clear definition of the requirements for qualification as a "preference customer" for the power generated at facilities constructed by the Federal Government.

It would be very helpful to have this matter defined with particular reference to conditions in the State of Alaska.

With best wishes, I remain,

Cordially yours,

ERNEST GRUENING.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., March 30, 1960.

Hon. ERNEST GRUENING,
U.S. Senate, Washington, D.C.

DEAR SENATOR GRUENING: We regret that our letter of February 29 has not, in your view, clarified the questions you have posed regarding the requirements or qualifications of a preference customer. However, as we attempted to make clear in our letter, the subject is not one which can be clearly delineated in general terms or on the basis of hypothetical consideration and, for that reason, it is not possible to pinpoint a definition which will be meaningful in all circumstances.

It may serve to illuminate the problem, however, if it is approached from the standpoint of the purpose intended to be served by the preference clause, which is the establishment of a priority in favor of a class of customers in the face of an insufficiency of power supply to meet all demands. Thus, let us assume two competing applicants with a power supply sufficient for only one, and with both applicants being municipalities. In this state of facts, the question of bona fides which you so cogently recognized in your letter of January 30 becomes of decisive importance. If one of the two applicants in this case fails to meet the test of bona fides, as discussed in our letter of February 29, while the other meets that test, the latter will be accorded the preference, even though each is a municipality.

Now let us take the same set of facts but with the modification that the supply of power is ample for both. In this case, both will be served because the intent of the preference provision is not to control the marketing of power by the United States, per se, but rather it is to establish the priorities in eligibility to purchase, a situation which is of primary significance only if there is not enough power to meet all demands.

Obviously, in actual cases, when there is an insufficiency of power, there can be many variations in the facts presented, and determinations therefore become difficult to predict in general terms. When the supply is ample the problem does not exist.

We hope that the foregoing will be illustrative of the principle involved and will serve to clarify the matter for you.

In the circumstance of the proposed Snettisham project, in which feasibility is largely dependent upon a single, large industrial use, the issue of authorization will turn, we believe, in the final analysis largely on whether the Congress considers it desirable to take this means of fostering the economic development of the State. The mechanism by which the power supply is proposed to be available to what, in practical effect, is the only available customer would, in itself, not appear to be of primary importance in the issue of project authorization.

If you still desire any further clarification on this matter, it is suggested that a verbal discussion with you might be helpful.

Sincerely yours,

FRED G. AANDAHL,
Assistant Secretary of the Interior.

DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington, D.C., October 10, 1960.

Hon. ERNEST GRUENING,
U.S. Senate, Washington, D.C.

DEAR SENATOR GRUENING: During discussions in Juneau in mid-September, you requested the Bureau to prepare a statement on the various types of preference customers as laid down by Congress in the several legislative acts dealing with sale of power from Federal powerplants. You indicated you want this statement for inclusion in the record of the Juneau hearings on the Snettisham project.

We are listing below the main categories of preference customers and reference to the acts in which they are set forth:

Municipalities—Villages, towns or cities organized under laws of a State:

(1) Town Sites and Power Development Act of April 16, 1906 (reclamation law) (34 Stat. 116).

(2) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

Public corporations or agencies—Corporations or agencies which are arms or divisions of the Federal, State or local governments. These include power districts, school districts, or other divisions of governing bodies:

(1) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

(2) Bonneville Act of August 20, 1937 (50 Stat. 731).

(3) Fort Peck of May 18, 1938 (52 Stat. 403).

(4) Flood Control Act of December 22, 1944 (58 Stat. 887).

Cooperatives—Nonprofit organizations, including REA cooperatives, irrigation districts, etc.:

(1) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

(2) Bonneville Act of August 20, 1937 (50 Stat. 731).

(3) Fort Peck Act of May 18, 1938 (52 Stat. 403).

(4) Flood Control Act of December 22, 1944 (58 Stat. 887).

For your information we are citing below excerpts from the various acts which set out the various types of preference customers.

(*a*) Reclamation Act of 1906: "* * * The Secretary of Interior is authorized to lease for a period not exceeding ten years, giving preference to municipal purposes, any surplus power or power privilege * * *." (Subsequent amendments have extended the term of years.)

(*b*) Reclamation Act of 1939 (sec. 485h(c)): "* * * That in the sale or lease preferences shall be given to municipalities and other public corporations or agencies; and also to cooperatives and other nonprofit organizations financed in whole or in part by loans made pursuant to sections 901–914 of title 7 (Rural Electrification Administration)."

(*c*) Bonneville Act of 1937: "In order to insure that the facilities for the generation of electric energy at the Bonneville project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the Administrator shall at all times, in disposing of electric energy generated at said project, give preference and priority to public bodies and cooperatives."

(*d*) Fort Peck Act of 1938: "In order to insure that the facilities for the generation of electric energy at the Fort Peck project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the Bureau shall at all times, in disposing of electric energy generated at such project, give preference and priority to public bodies and cooperatives."

(*e*) Flood Control Act of 1944: "* * * The Secretary of the Interior * * * shall transmit and dispose of such power and energy in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound busines principles, the rate schedules to become effective upon confirmation and approval by the Federal Power Commission. Preference in the sale of such power and energy shall be given to public bodies and cooperatives. The Secretary of the Interior is authorized, from funds to be appropriated by the Congress, to construct or acquire, by purchase or other agreement, only such transmission lines and related facilities as may be necessary in order to make the power and energy generated at said projects available in wholesale quantities for sale on fair and reasonable terms and conditions to facilities owned by the Federal Government, public bodies, cooperatives, and privately owned companies * * *."

We are pleased to furnish you this information.

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

Commissioner DOMINY. May we go off the record for a moment, Mr. Chairman?

Senator GRUENING. Yes, indeed; off the record.

(Discussion off the record.)

Senator GRUENING. While off the record we have discussed the question of a preference customer, and the Commissioner of Reclamation points out that it may not be essential to the passage of this legislation

to have one, but nevertheless we anticipate that the issue may be raised in the Congress and that it may be an important factor in getting this bill enacted. Therefore, I have suggested that the mayor of the city and the representatives of the Glacier Electric Cooperative and the city of Douglas, together with the commissioner of natural resources of the State and maybe the commissioner of commerce, go into this matter and explore the possibility of setting up some agency that would qualify as a preference customer. Thereby perhaps would be diminished one obstacle which might be raised when this legislation is presented for the consideration of the Congress.

The important thing for the record however, is that in the view of the Department, as presented by the Commissioner, a preference customer may not be essential to the enactment of the legislation.

Commissioner Dominy, have you had any experience in which projects by the Bureau have not had preference customers? Has there been one in which a private enterprise was granted upon?

Commissioner DOMINY. I don't know of any power project or one of our multiple-purpose projects with power as one of the principal features where all of the power has been made available through nonpreference entities. In a good many cases part of the power has been allotted in the early years of the project development to nonpreference customers so as the preference customer load develops, the power would be withdrawn from a nonpreference user and made available to a preference user.

Senator GRUENING. Would the creation of a power district in this area satisfy the requirements as you understand them?

Commissioner DOMINY. There are many types of preference customers through which power is marketed in accordance with preference laws established by Congress. The Arizona Power Authority is a State authority with whom we deal. Nevada has a State power agency with whom we deal in that area. It would be my judgment that the State of Alaska could, very properly, work out some type of power authority that would meet the requirements as laid down by Congress in the various preference laws indicating the manner in which federally introduced power could be marketed. As a matter of fact, if such an authority could be worked out here, I would certainly be interested in exploring even the operation of this project by the State rather than the retention of the operating responsibility throughout the repayment period of the Bureau of Reclamation.

Senator GRUENING. Well, now in the case of previous projects such as Bonneville and Grand Coulee, there are separate authorities, are there not, for each of those projects or for some of those projects?

Commissioner DOMINY. The marketing of power from federally constructed plants in the Pacific Northwest is done by the Bonneville Power Administration. Elsewhere throughout the United States it is done either by the Bureau of Reclamation or by the agencies established within the departments, such as the Southeastern and Southwestern Power Administrations.

Senator GRUENING. Do you think that the fact that Alaska is not a reclamation State would prevent the Bureau of Reclamation from operating this project?

Commissioner DOMINY. Not at all. In the case of power the entire cost is repaid to the Treasury with interest. So Alaska, being a non-

reclamation State in my judgment, should participate in federally sponsored power projects the same as any other State in the Nation, including other nonreclamation States that have Federal projects.

Senator GRUENING. Mr. Commissioner, would it be possible for you and your agency, in view of this discussion and in view of your knowledge of this problem and interest, to submit some suggestions as to alternative methods of setting up a "preference customer"?

Commissioner DOMINY. Yes; I think that would be possible.

Senator GRUENING. I think those would be useful for the record; I think they would be useful for the committee in considering this and to the Congress. I think the Congress should be apprised of some of the problems that are involved in trying to meet this traditional desire for a "preference customer," and, if we have the views of the Department on the pros and cons, I think it would be very helpful and would straighten the record.

Commissioner DOMINY. Very well, sir, we will prepare such a statement for the record.

(The following communication was subsequently submitted:)

OCTOBER 10, 1960.

Hon. ERNEST GRUENING,
U.S. Senate, Washington, D.C.

DEAR SENATOR GRUENING: During discussions in Juneau in mid-September, you requested the Bureau to prepare a statement on the various types of preference customers as laid down by Congress in the several legislative acts dealing with sale of power from Federal powerplants. You indicated you want this statement for inclusion in the record of the Juneau hearings on the Snettisham project.

We are listing below the main categories of preference customers and reference to the acts in which they are set forth:

Municipalities: Villages, towns, or cities organized under laws of a State.

(1) Town Sites and Power Development Act of April 16, 1906 (Reclamation law) (34 Stat. 116).

(2) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

Public corporations or agencies: Corporations or agencies which are arms or divisions of the Federal, State, or local governments. These include power districts, school districts, or other divisions of governing bodies.

(1) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

(2) Bonneville Act of August 20, 1937 (50 Stat. 731).

(3) Fort Peck Act of May 18, 1938 (52 Stat. 403).

(4) Flood Control Act of December 22, 1944 (58 Stat. 887).

Cooperatives: Nonprofit organizations, including REA cooperatives, irrigation districts, etc.

(1) Reclamation Project Act of August 4, 1939 (53 Stat. 1187).

(2) Bonneville Act of August 20, 1937 (50 Stat. 731).

(3) Fort Peck Act of May 18, 1938 (52 Stat. 403).

(4) Flood Control Act of December 22, 1944 (58 Stat. 887).

For your information we are citing below excerpts from the various acts which set out the various types of preference customers.

(*a*) *Reclamation Act of 1906.*—"* * * The Secretary of Interior is authorized to lease for a period not exceeding 10 years, giving preference to *municipal purposes*, any surplus power or power privilege * * *." (Subsequent amendments have extended the term of years.)

(*b*) *Reclamation Act of 1939 (sec. 485h(c)).*—"* * * That in the sale or lease *preferences shall be given to municipalities and other public corporations or agencies; and also to cooperatives and other nonprofit organizations* financed in whole or in part by loans made pursuant to sections 901–914 of title 7 (Rural Electrification Administration)."

(*c*) *Bonneville Act of 1937.*—"In order to insure that the facilities for the generation of electric energy at the Bonneville project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the Administrator shall at all times, in disposing of electric energy generated at said project, give *preference and priority to public bodies and cooperatives.*"

(*d*) *Fort Peck Act of 1938.*—"In order to insure that the facilities for the generation of electric energy at the Fort Peck project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the Bureau shall at all times, in disposing of electric energy generated at such project, give *preference and priority to public bodies and cooperatives.*"

(*e*) *Flood Control Act of 1944.*—"* * * The Secretary of the Interior * * * shall transmit and dispose of such power and energy in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles, the rate schedules to become effective upon confirmation and approval by the Federal Power Commission. *Preference in the sale of such power and energy shall be given to public bodies and cooperatives.* The Secretary of the Interior is authorized, from funds to be appropriated by the Congress, to construct or acquire, by purchase or other agreement, only such transmission lines and related facilities as may be necessary in order to make the power and energy generated at said projects available in wholesale quantities for sale on fair and reasonable terms and conditions to facilities owned by the Federal Government, public bodies, cooperatives, and privately owned companies * * *."

We are pleased to furnish you this information.

Sincerely yours,

FLOYD E. DOMINY, *Commissioner.*

Senator GRUENING. I think before leaving here the mayor can fully enlighten you if you need enlightenment on what problems there are in setting up a local "preference customer." None of these problems are entirely simple. Needless to say, we would like to have the simplest solution possible so as to avoid as many as possible of the obstacles which are inevitably raised when any important project is presented to the Congress.

Commissioner DOMINY. Well, I had the opportunity when I was here a year ago of discussing this with the mayor and some of the business leaders and, of course, I did have an opportunity to meet the mayor and discuss it further with him and members of my staff on the occasion of his visit to Washington.

We will be as helpful as we can and supply the kind of statement that would give the various alternatives that historically have been used or might possibly be used.

Senator GRUENING. I think that the committee would appreciate that and we are very grateful to you.

I see Mr. Fred Estaugh, who is a counsel for the Georgia-Pacific here. Mr. Eastaugh, would you have any comment that you would care to make? We would be very happy to hear from you if you would like to speak.

STATEMENT OF FRED EASTAUGH

Mr. EASTAUGH. Well, Mr. Chairman, my name is Fred Eastaugh and, as the chairman said, I am local counsel for the company which holds the preliminary award for the Juneau unit, the timber sale contract.

I am not authorized to make any statement, Mr. Chairman. I was asked, however, to attend the hearing and I would like to express on behalf of Mr. Buckley his regrets in not being able to be personally present.

If there are any questions the Chair might have, I would be pleased to respond as far as I can.

Senator GRUENING. Well, of course, Mr. Buckley, of the Georgia-Pacific, and you will be furnished with a transcript of the hearings and in which I am sure the company will be interested and naturally

the sooner the company can make up its mind what it proposes to do the better it will be for all concerned. Because whatever the Georgia-Pacific does, there is no question that we are going to need more power here and its acceptance of the contract from the Forest Service would speedily bring the matter to a head. If that is not to take place, certainly the Forest Service and the other agencies of our State government, as well as the Federal Government, will be in search of other customers.

Mr. EASTAUGH. Well, thank you. I was also interested in your comment that the record will be kept open and it might be that, before it closes, additional information may be made available.

Senator GRUENING. Well, we will keep the record open for not less than 4 weeks so that there will be ample opportunity to supply any additional information that seems pertinent.

Mr. EASTAUGH. Thank you, Mr. Chairman.

Senator GRUENING. Thank you very much, Mr. EASTAUGH. Are there any other witnesses who would like to be heard on the subject of Snettisham? I see Mr. Wells here, representing the Juneau Chamber of Commerce, which I know is very much interested in all problems of development. Mr. Wells, would you like to make any statement on this subject?

STATEMENT OF BOB WELLS, MANAGER, JUNEAU CHAMBER OF COMMERCE

Mr. WELLS. Mr. Chairman, I am Bob Wells, manager of the Juneau Chamber of Commerce. The executive board of the chamber asked that I attend today primarily as a matter of information. I believe you are aware that some 3 years ago the chamber appointed a 13-man special power committee, which made a very exhaustive study of possible power requirements for the Juneau area. The chamber is following developments along these lines very carefully and is very anxious that additional power be made available, both for industry including the development of not only forestry products, but mining or other industries it might attract.

I think that the actual detailed information furnished by Mr. Nagel and others about covers the ground. The chamber did not have any specific information to offer, other than the fact that we are anxious that anything be done that is possible to provide additional power for the Gastineau Channel and southeastern Alaska area.

Senator GRUENING. Mr. Wells, can you tell us of any possible local developments such as additional housing accommodations, additional apartments, additional hotel facilities, that you anticipate in the Greater Juneau area in the next few years?

Mr. WELLS. I believe the figures given of the increased local needs for domestic power uses indicate an increased number of homes, and persons needing power. Of course, if new residents come into new homes, they will need power and a certain amount of power in their office spaces.

Our housing committee reported some 2 weeks ago that there were some 45 new homes to be completed by January 1 of next year. We anticipate an even greater number will be built next year which reflects an increased domestic need for power and, of course, many of

those people may be living in smaller homes at present. When they are able to get into larger homes, they will increase the use of electricity. But in addition to that, we have every hope that our tourist industry will develop rapidly in the next several years. You perhaps are aware of plans for a new tourist-type hotel which would have the tendency to attract a large number of additional visitors to the area and certainly, at least, would put a seasonable increase in the demand for electrical requirements on our area.

Senator GRUENING. Can you give us any details about this proposed tourist-type hotel?

Mr. WELLS. Basically it would be a development near town, which would include a long-range plan. I believe no firm commitment on certain phases of it have been released, but that it would basically have motel-type units as well as a hotel with banquet rooms and convention facilities. Once it was completed, I am sure it would add a very sizable increase in the demand for electricity. Regardless of whether that particular project goes in or not, we do anticipate that some sort of development of that nature is in the offing in the next few years to take care of what we hope to be a great, growing, and thriving visitor attraction for the area.

Senator GRUENING. Thank you very much, Mr. Wells; I appreciate your testimony.

Is there anyone else who wishes to testify on the Snettisham project or the needs of the Juneau-Douglas area? If not, we will range a little further afield in southeastern Alaska. I notice the city manager of Ketchikan is here, Robert Sharpe. Would you come forward Mr. Sharpe and tell us what the situation is in Ketchikan, which is running neck and neck with Juneau in the matter of population, and has a thriving pulp industry at the present time which Juneau does not have.

STATEMENT OF ROBERT SHARP, CITY MANAGER OF KETCHIKAN

Mr. SHARP. Mr. Chairman, I am glad to hear that the city of Ketchikan is not the only city that has power problems. I have a prepared statement which I would like to insert in the record. I would like to talk from that statement, Mr. Chairman.

Senator GRUENING. We are glad to have your discussion.

Mr. SHARP. The city of Ketchikan owns and operates two small hydroelectric stations of total firm capacity of just under 8,000 kilowatts. We are at this point without any reserve capacity whatsoever. In fact we feel that this year we will have to use diesel equipment to take care of the peak requirements. And as a matter of economics, we don't ordinarily operate new equipment. This power situation on development of diesel sources particularly is kind of like the chicken and egg proposition. If you had more power available to sell you could go out and sell the power. Where you don't have it for sale you end up with the rate which is not conducive to expanding your use of power. I call attention to the rate schedule of the city of Ketchikan as attached to the statement. When we reach the consumption of 1,200 kilowatt-hours a year in our residential schedule, we raise our rate by three-quarters per kilowatt-hour. In other words, we are discouraging use because of the shortage of power supply.

Even with that type of rate you will note in the analysis of the historical consumption of energy, that it has been increasing from 8 to 10 percent a year since 1950. The historical record will even date back to 1935 if you care to go back that far.

The one project which has had detailed engineering in the Ketchikan area is the Swan Lake project, and this statement requests that the engineering cost analysis and so forth be updated and that a new approach be taken in financing this project to permit a period of development. Now if the city or any other utility is required to take a block of power that makes this one project feasible, without a development period, it is going to adversely affect the rates if you keep it on a revenue-sustained basis. So rather than to encourage industry that might develop in your area, you are going to discourage it.

One thing we ask in the prepared statement, is that the Swan Lake report be updated. We have in mind such things as this: In our Beaver Falls plant, which has been operated manually, we're converting to semi-automatic operations or perhaps I should even say, remote controlled operation. We will be operating that plant from Ketchikan some 13 or 14 miles away. It will save the salaries of four operators, supplying of cottages, the other expenses related to manual type of operation. I can envision that perhaps the Bureau of Reclamation or any agency might build Swan Lake with remote or automatic operation. We would like to see that approach explored on the Swan Lake project.

I presume from all I've read of the engineering report, stage development of the Swan Lake is not feasible. Except perhaps for the generating machinery itself, it may be feasible in that installation. But the main cost of the dam, penstocks, and other facilities could not be staged, thereby making the project feasible at this time. The city certainly would be interested in the development of that project. I might before I'm off the stand Mr. Chairman, ask Mr. Roberts a question in that regard.

There are a number of power sites in the Ketchikan area that have never been fully engineered. I am aware of the Corps of Engineers Report No. 1, in which it lists any number of sites, I think, with a capacity in excess of 1,000 kilowatts. Most of them are relatively small. Some of those sites have the possibility perhaps of production that would be even less costly per kilowatt-hour or perhaps a smaller size might make them feasible now.

In addition to the prepared statement, I would like to request that the committee do whatever it can and do this through executive channels as well. Insofar as the possibility of more detailed engineering in the area is concerned, we think it is needed and we know that every year there will be an increased power demand. Regardless of whether or not we have new industry, that has been the history. With the normal growth in population, coupled with the increased consumption by customers—and rate has a great deal to do with it—there is going to be an additional need for power supply.

I think the city since 1950 has in one way or another increased its power supply in small amounts, every 2 to 3 years. Now these individual developments of small supplies are more costly. We are beginning to feel the pinch at this time, and fear that unless we can get a site of enough size to carry us at least another 5 to 10 years we

are going to have to disturb our rate structure, which is not really too favorable now although for Alaska it is quite a favorable rate.

If I could now ask Mr. Roberts if there is any feasibility of developing Swan Lake from the engineering standpoint?

FURTHER STATEMENT OF DARYL ROBERTS

Mr. ROBERTS. In investigating Swan Lake, we looked at it as a possibility for a stage development, but it doesn't lend itself very favorably other than, as you suggest, by putting in part of the units as an initial installation, and deferring others for a later time. The damsite is well down on the stream there and the storage is required in the lake area. This means you have to have a full-sized dam. In other words, it wouldn't be practical to build a low dam and then enlarge it later. This would be very expensive and increase the overall costs for the development. So the only possibility of getting minimum cost power would be to build the dam and the waterways, then defer a part of the power installation until the loads build up.

However, you have brought out a good point that could stand some exploration; that is, your suggestion of telemetering or remote control. In figuring the power cost of course, there is the O. & M., that must be considered. Where that can be cut down then of course it is possible to reduce the power rates. We would be very interested in reviewing that again and also in exploring other possibilities down there to help you out.

Senator GRUENING. I would like to ask Commissioner Dominy or Mr. Roberts, whether it isn't possible for the Bureau of Reclamation to start investigations in this area. Now you have an annual limit of $250,000. We attempted to take the limit off, as you know, and the bill to take the limit off passed the Senate but did not pass the House. We will try to get it passed the next time.

Now my understanding is that you have completed your studies on Devil Canyon, and you have Chakachamna ahead. Would it be possible for you to extend your surveys to southeastern Alaska, into some of these communities such as Ketchikan?

Mr. ROBERTS. Well, yes, it would; however, in programing these studies we have to get a program through the Bureau of the Budget and the Congress. That program has already been fixed for fiscal year 1961. However, I believe that with proper justification we might be able to get the program revised a little bit, and possibly in later years we could set up a program for that area. I think that would be quite possible.

Senator GRUENING. May I ask, What does the present program that is now set up contemplate for the next year?

Mr. ROBERTS. In this fiscal year we are scheduling investigations on the Chakachamna project, which is about 80 miles due west of Anchorage—across Cook Inlet. We are also studying the Vee Canyon site on the Susitna River. Those are the two hydro projects that we will be looking at. We also have the completion of a study which will be a reconnaissance investigation of the Speel River division of the Snettisham project. So, as far as this fiscal year is concerned, we have our hands full. But in subsequent years it might be possible to switch the program somewhat and move into the Ketchikan area and give that some more study.

Senator GRUENING. Thank you, Mr. Roberts.

Mr. SHARP. Mr. Chairman, may I make it clear to Mr. Roberts that the city of Ketchikan is at a rather crucial point. We have the possibility of increasing a very small amount of the power supply by developing the Lake Whitman hydroelectric station for only 1,300 kilowatts firm capacity. Now we are either going to have to do that immediately to carry us another year or two, or maybe less, or go into another project and put it on the line in a matter of a few years. We then would have enough capacity to carry us a number of years. We have the engineering development at this point to go ahead with the Whitman project.

May I ask further, Mr. Chairman, Has there been in the history of the Federal agencies on new power projects where a development period of 5 to 10 years is permitted, like, I understand, is often done on irrigation projects, where the principal or capital payments would be deferred, or maybe even some of the interest capitalized to insure the initial feasibility? Has that been done, or is it possible that that course may be taken?

Senator GRUENING. Commissioner Dominy, can you answer that question?

FURTHER STATEMENT OF COMMISSIONER DOMINY

Commissioner DOMINY. I know of no project that has been constructed with that type of financing involved. As Mr. Roberts pointed out a moment ago, in a 50-year payout analysis frequently full utilization of the constructed feature is not accomplished immediately, but the capitalization and interest during construction and interest over the 50-year period and payout analysis is always based on what revenues will be received over the 50-year period.

Senator GRUENING. Could I ask this question, Commissioner? How firm are the obligations that you have to make the investigations which Mr. Roberts pointed out? It seems to me that the Speel River, for instance, which is certainly subsequent to the development of Snettisham, for which we still have to get authorization, could properly be deferred in the face of something more urgent. Is that in accord with your thoughts?

Commissioner DOMINY. We have this problem; it is one of mechanics. The Appropriations Committees of Congress have seen fit in recent years to limit the transfer of general investigation funds to 15 percent within any given project that was testified to as being in the current year's program without committee clearance. We are not authorized to shift any money to undertake an unbudgeted item.

Now, if the facts warrant a shift in emphasis, letters can be addressed to the Committees on Appropriations in the Senate and in the House. If we obtain Budget Bureau clearance for that shift and clearance from the chairmen of those two committees, we would then be authorized to make the adjustment within the budget year. I have no reluctance at all, Mr. Sharp, to considering such a shift and, if there is supportable justification that this is in the interest of the communities and to our programs, we will be happy to try to make the adjustment.

Senator GRUENING. Well, if the Bureau will go along I certainly will be glad to initiate such a move, because it does seem to me that the

Speel River study could be deferred, and if Ketchikan, as the city manager, Mr. Sharp, indicates, has a pressing problem we would like to see that advanced to give them priority.

Commissioner DOMINY. If that could be done within the funds available and advance the program to a realistic degree, I agree.

Senator GRUENING. How much do you have budgeted for Chakachamna and how much for the Vee Canyon?

Mr. ROBERTS. Well I will have to rely on my memory. I didn't bring my supporting documents along on this question. However, as I recall, we have a program of about $80,000 on Chakachamna, about $35,000 on Snettisham and the remainder on the Vee Canyon, which is about $145,000. We do have one other small investigation going which entails very little money. That is one in Matanuska, studying the merits of sprinkler-irrigation in Alaska.

Senator GRUENING. Thank you very much. Well, do you not think that the Vee Canyon might also be subject to postponement in view of the fact that that entire project is still not ready for action?

Mr. ROBERTS. Well of course, we are very interested in taking care of the pressing needs that are called to our attention, like that which has been brought up by Manager Sharp this morning. We are certainly willing to listen to it, and go along with it as far as we possibly can. The only difficulty we perceive would possibly be in getting clearance for necessary shifts of our program. We're willing to go along as far as we are able to do so in covering these needs.

Senator GRUENING. Well, I should think that since it costs no more money, the Bureau of the Budget wouldn't raise any objection.

Mr. ROBERTS. Well I'd rather the Commissioner answer that one, he's right next to them. I sometimes think that maybe they might.

Commissioner DOMINY. It only introduces a new investigation into the budget year—after the budget had been cleared and presented to Congress. This complication is not insurmountable.

Senator GRUENING. Well, we'll try and surmount it; thank you.

Mr. SHARP. I believe, Mr. Chairman, that is all I have to say to supplement the statement which has been submitted.

Senator GRUENING. Well, the statement will be included in the record and the record will be kept open for 4 weeks; so, if there is any additional information that you would desire to submit in behalf of you make it as soon as possible so that the authorities—the Bureau of Reclamation, and the Congress, and others—may have it. We certainly want the growth of Ketchikan not to be inhibited by lack of power. We want to proceed as rapidly as we can to study those needs and if possible to satisfy them.

Mr. SHARP. It occurs to me, Senator, that I might make one general statement either on or off the record. The whole southeastern area, I am confident, is going to grow, and its power needs are going to grow along with it, when the car-ferry system goes into operation. You notice I say "when," not "if," and I feel confident that with its merits and justification it can be financed this fall when the voters ratify a bond issue. I think this is going to have a very substantial effect on every other community throughout southeastern Alaska. That should be taken into consideration in any market survey that is made in any of the communities—Ketchikan along through Haines, Skagway—and I'm sure there will be more heard on that subject later.

But I think any agency that is considering a power market survey should keep that in mind in the next few years.

(Mr. Sharp submitted the following statement for insertion in the record:)

STATEMENT OF DEVELOPMENT OF HYDROELECTRIC POWER RESOURCES OF THE CITY OF KETCHIKAN, BY ROBERT E. SHARP, CITY MANAGER

The city of Ketchikan is pleased to have the opportunity to present its views on the need for developing additional hydroelectric power resources to serve the industrial, commercial, and residential requirements of the city of Ketchikan and surrounding area. Low-cost power has and will continue to play an important role in the economic development of the city of Ketchikan and surrounding area.

Attached hereto as exhibit A is a brief description of Ketchikan and surrounding area.

For over 25 years, the city of Ketchikan has owned and operated the power facilities serving the city and adjacent area. The total net book value of such facilities is $6,454,805.05. In addition to electric distribution facilities, the following generating facilities are owned and operated:

Facility	*Peak capacity in kilowatts*
Ketchikan Lakes Hydroelectric Station	4,500
Beaver Falls Hydroelectric Station	3,400
Total hydroelectric	7,900

The city owns, for emergency purposes, three small diesel electric plants with a total peak capacity for all units of 900 kilowatts. Such units are considered uneconomical for other than emergency use.

The historical and projected peak demands on the system for the period 1950–70 are as follows:

Year	Kilowatt-hours	Load factor	Peak demand, kilowatts	Year	Kilowatt-hours	Load factor	Peak demand, kilowatts
HISTORICAL				1957	34,447,345	56.0	7,000
1950	22,388,000	52.8	4,650	1958	35,331,120	53.7	7,500
1951	24,076,000	50.0	5,320	1959	37,377,000	53.0	7,520
1952	26,795,000	52.4	5,600				
1953	31,052,000	54.4	6,300	PROJECTED			
1954	31,822,000	51.9	6,600	1960	37,800,000	53.0	8,120
1955	32,290,000	51.9	7,100	1965	44,000,000	53.0	9,480
1956	33,409,000	53.0	7,200	1970	50,000,000	53.0	10,750

The city does not now have sufficient generating capacity to meet present peak demands if one of the Beaver Falls units is out of service. The lack of adequate reserve capacity is a critical problem now confronting the city.

The above projections by consulting engineers were based on the historical growth period from 1955 through 1958, a period when no new industries or important growth of existing industries occurred. For this reason they are on the conservative side. For example, the initiation of ferry service in 1962 (for which Alaska voters will decide on a bond issue this November) through southeastern Alaska and the resulting increase in tourism and allied developments would no doubt advance the energy requirements and peak power demand to the 1970 projection by 1965, if not earlier. There are a number of mineral survey and exploration parties working this area which may prove the feasibility of developing production plants requiring substantial quantities of power. Obviously, it is timely to take a good look at larger hydroelectric project than the city has been able to develop to date. The only such project for which a detailed study and report has been rendered is Swan Lake.

The Bureau of Reclamation of the Department of Interior issued a report on the Swan Lake project in 1951. This report indicates a potential development of a single-purpose power project of 13,500 kilowatts at an estimated cost of $10,485,000, with project benefits exceeding costs by a ratio of 2.52 to 1.0. The

proposed project is located on public domain 22 airline miles northeast of Ketchikan. A dam would be built on Falls Creek, outlet of Swan Lake, a glacier-formed body of water. The area is currently accessible by boat and hydroplane. The project would involve construction of an arch dam to raise the lake surface 100 feet to elevation 325.6 feet. A penstock, surge tank, powerhouse, and transmission line would complete the major features of the project.

The Swan Lake project would add 71 million kilowatt-hours of firm energy annually to the public supply in Ketchikan. Nonfirm energy would be about 8.8 million kilowatt-hours annually. Power from a powerhouse at tidewater would travel to the load center at Ketchikan through 31 miles of 69-kilovolt line. The project would be paid out in 50 years at 7.5 miles if the entire output could be initially marketed.

There has been a lapse of almost 10 years since the initial study for the report on Swan Lake. Therefore, the city requests that the Bureau of Reclamation be authorized and provided funds to update this report. There are changes in construction costs, power markets, and technical developments affecting construction and operation since the initial study and report. Such updating or restudy of the project should also include examination of an alternate repayment method so that the costs to the city during the initial period of operation of the project would be established on the basis of power utilization. Such scaling of costs to power utilization would require a modification of the customary 50-year repayment plan and the inclusion of a development period common to many irrigation projects wherein principal payments are deferred, and possibly some interest capitalized so that the increase in debt service costs would be coordinated with the increase in power utilization. It is desirable to amortize the cost of this project over a sufficient period of years to keep the power costs to the city at a level that will permit continuation of existing consumer rates. (Attached hereto as exhibit B is a copy of the electric rates currently in effect.) The city's current production cost, including all depreciation, transmission, interest, taxes, and administrative and general expenses, ranges from $0.0186 to $0.0189 per kilowatt-hour. Direct generating costs (including depreciation of production plant) ranges from $0.0065 to $0.0068. Revenue per kilowatt-hour sold ranges from $0.0193 to $0.0195.

The city's supply of power is insufficient to attract industry or expand consumption by its existing customers. It will be noted in this regard that diesel units will be required to meet the projected peak demand for 1960 and that residential schedule A discourages use of electric energy in excess of 1,200 kilowatt-hours per month. For this reason the city feels it is timely to restudy the Swan Lake project as previously outlined to allow a market development period following its initial operation. This subcommittee is urged to provide the necessary authorization and funds for such restudy.

EXHIBIT A. HYDROELECTRIC POWER DEVELOPMENT—CITY OF KETCHIKAN AND VICINITY

The city of Ketchikan is located on the southwestern shore of Revillagigedo Island in the South Tongass National Forest. Revilla Island has an area of 1,160 square miles. The topography of the island is mountainous and is cut by numerous streams and waterways. The island mountain peaks range as high as 4,560 feet (Mount Reid), with numerous peaks exceeding 3,000 feet in elevation. These peaks act as a "trap" resulting in heavy rainfall (average 156 inches in Ketchikan). The island has a dense forest cover of spruce, hemlock, cedar, and other species.

The city and vicinity served by its power and light facilities has a population of some 9,000. The economy of the city is primarily based on forest and fishery products. There are eight cold storage and fish cannery plants in the area that process salmon, halibut, and other species of fish. The Ketchikan Pulp Co. completed a 500-ton-per-day plant at Ward Cove near Ketchikan that has been in operation since 1954. The Ketchikan Spruce Mills sawmill located in the city has been in operation, with a capacity of 100,000 board measure per shift, since the turn of the century.

Tourism, while relatively small at this time, offers a great potential because of the scenery, recreation areas, fish, game, and other attractions. A car ferry or other surface transportation for motor vehicles would open up this industry which conceivably could exceed any one of the major basic industries of the area currently existing.

EXHIBIT B. HYDROELECTRIC POWER DEVELOPMENT

	Cents per kilowatt-hour
Electric schedule A. Residential service:	
1st 50 kilowatt-hours per month	5
Next 100 kilowatt-hours per month	3
Next 1,050 kilowatt-hours per month	1¼
All over 1,200 kilowatt-hours per month	2
Electric schedule B. Commercial general services:	
1st 100 kilowatt-hours per month	5
Next 300 kilowatt-hours per month	3
Next 2,600 kilowatt-hours per month	2
Next 7,000 kilowatt-hours per month	1.4
All over 10,000 kilowatt-hours per month	1
Electric schedule D. General power:	
1st 50 kilowatt-hours per month	4
Next 10,000 kilowatt-hours per month	1¼
Next 10,000 kilowatt-hours per month	1
Excess kilowatt-hours per month	.9
Electric schedule I. Limited industrial power service (dump power schedule at option of management):	
1st 100 kilowatt-hours per kilowatt of maximum demand per month	1¼
Excess kilowatt-hours per month	.8

NOTE.—Miscellaneous schedules AB small boat service, F temporary power, G municipal street lighting, and J pole contact have been eliminated from this exhibit.

Senator GRUENING. Thank you very much, Mr. Sharp. Coming northward from Ketchikan, is the city of Wrangell represented here? Is the city of Petersburg represented? The city of Sitka? City of Skagway? Mr. Reed, will you come forward, we are very happy to have you.

STATEMENT OF STATE REPRESENTATIVE MORGAN REED

Mr. REED. I am Morgan Reed, State representative for the Lynn Canal area. Skagway is at the extreme north end. I came here more as an observer and have no prepared statement to make, but I would like to hear some discussion of our power potential in the Taiya area.

We are fortunate to have at our back door one of the largest power potentials in the North American Continent. We have a vast storage area which is located over on the Canadian side of the headwaters of the Yukon and we have the power site over on the Alaska side. This presents quite a problem as we have found over the past 10 years. It is not a problem of obtaining power, there is a potential of over 5 million horsepower, and I am quoting figures of 10 years ago when the Aluminum Co. came in and made their investigation. The Bureau of Reclamation also came in and made its investigation. There have been volumes of reports made by different agencies and different companies on this project. So there is no need for me to quote statistics. I merely want to point out that we have this power potential right at our back door, and we are interested above all else in the development of this project.

The city of Haines, our immediate neighbor—16 miles away—has minerals in great quantities there, particularly iron ore. They have deposits of iron ore there that have never been exploited. It has never been even proven up just how great it is, but we do know that there is an immense body of iron ore there. However, it contains a high content of titanium, which I understand requires electrical power to reduce it.

Now, we in Skagway have the power or would have the power, if properly developed. We could utilize this ore in the Haines area and the whole area up there is highly mineralized. There is not only iron ore, but the city of Skagway is kept up by the shipment of base metals being sent from the Yukon at a very high freight rate. Now if we had reduction plants right at Skagway, it would cut down the costs to where they could compete on a much more favorable basis in the markets of the world.

(See letter from Owen Ore Co. in appendix.)

Senator GRUENING. Will you tell us for the record what the present power and light situation is in Skagway?

Mr. REED. It is mostly a diesel operation which carries a high rate. We have a small hydroplant there, but we do not have sufficient water storage to keep going on a year-round basis. It has to be augmented all year round by diesel power.

Senator GRUENING. And yet you are right close to the greatest power supply on the North American Continent?

Mr. REED. Right.

Senator GRUENING. You are like the Ancient Mariner, "Water, water everywhere, but not a drop to drink."

Mr. REED. I sit here and listen to comments made by all the towns of southeast Alaska and we have right at home the basis for a great power grid which would cover the whole of southeastern Alaska.

Senator GRUENING. All we need is to get the assent of the Canadian authorities.

Mr. REED. There is the problem that we encountered before, and I do not believe it is an insurmountable problem—if properly approached I find that the Canadians are very easy to get along with. However, it does require a diplomatic approach which was not taken when the project was originally discussed. I understand that more than all else, we rubbed the Canadians the wrong way and met with a refusal to utilize the water for which they have the storage capacity.

Senator GRUENING. Well, we were all very much disappointed when the plans of Alcoa went on the rocks for lack of Canadian assent. Now we had a very promising meeting with the British Columbia and Yukon authorities in Victoria a few weeks ago, and I know another meeting is scheduled in the near future in which we hope to discuss—not merely road connections, where you have a similar problem of requiring Canadian assent, and power problems, too. I share with you, Representative Reed, the hope that we can make progress in that direction.

Mr. REED. That is our only hope. We have been living on hopes for a number of years and I see our town not expanding the way it should do with the resources that we have. They have to be developed through the development of power. It is our earnest wish that something can be done about this. Perhaps the proper approach, the proper distribution of power between the Canadian Government and the American Government could be arrived at and the proper distribution cost could be discussed with them again. I am certain from the reports I have heard from time to time that there are a number of industries who would be interested in coming in there, if the power were made available.

Our needs at home are also something that should be taken into consideration. Our power costs are very great, both at Haines and Skagway, and that along with the development which could be made if the power were available is something that I would like to see taken under consideration by our Federal Government again.

Senator GRUENING. Well, it is obviously a great waste and past history shows lack of interest and lack of concern with our situation. When a community such as Skagway has these ample resources at its back door and is yet obliged to import fuel at a high cost to supply its needs, action is demanded. The purpose of these hearings is to try to develop the facts and to bring those facts to bear on the appropriate authorities, Federal and State, to see whether we can't improve the situation.

Mr. REED. As Mr. Sharpe pointed out, the problem that we face up there is obvious. If we have the power we would have the need for it, but with the cost of power what it is at the present time we cannot develop the need for it.

Senator GRUENING. Thank you very much Representative Reed.

The Federal Power Commission is represented here by Mr. Lesher Wing, regional engineer at San Francisco. Mr. Wing would you care to make a statement?

STATEMENT OF LESHER S. WING, FEDERAL POWER COMMISSION

Mr. WING. I am very pleased to be here. I am somewhat in the unfortunate position of having just arrived on my first visit to Alaska, and it seems a little inappropriate for me perhaps to be telling the Alaskans how they should run their affairs and what they need and how much new development they should have, and so on. However, the Federal Power Commission has made two surveys of power in this area in the past.

One was in 1947, and we recently completed one in 1957, which was published as of May 1960. I think you have already received a copy of that. If you care to have one placed in the record I have one which I can supply.

Senator GRUENING. Thank you; it will be filed for the record.

Mr. WING. What I have to say is really merely an abstract of the statements which appear in the report. I had prepared a brief statement, but I think parts of it have been covered so well already, that it would be inappropriate for me to repeat them. I will therefore just briefly summarize some of the more pertinent facts.

GROWTH OF POWER REQUIREMENTS

In 1948, according to our previous survey, installed generating capacity which could be accounted for in Alaska, amounted to 70,600 kilowatts of which 24,000 kilowatts were operated by electric utilities. The figure of 70,600 kilowatts was exclusive of a considerable amount of steam-electric capacity in major military installations, the size of which was not available to us at that time. Our 1957 survey, however, covered the entire requirements of industries, military, and the electric utilities. The total capacity at that time was about 316,000 kilowatts and our 1959 reports from these various sources indicates that it has now grown to 345,000. Referring to the 316,000 figure, of this

total, 104,900 kilowatts were in powerplants of utilities which is nearly four and a half times greater than that of 1947. In other words, the utility loads grew about four and a half times in a period of approximately 10 years; 48 percent of this utility plant capacity was hydroelectric. Powerplant additions of utilities scheduled and now under construction will, by 1965, increase the capacity of Alaska's utilities system by about 45,000 kilowatts. This 45,000 kilowatts will be primarily in hydro capacity, although from what I've heard this morning it appears that there will be some other fuel-electric plant put in because there isn't enough hydro coming along.

This will make the total installed recorded capacity of about 156,000 kilowatts by 1965. It is these power requirements to be supplied in the future by Alaska's electric utilities which are of immediate interest and which can be estimated with some degree of assurance as to their reasonableness.

Because the size of the military force and the type of installations which may be programed at any future date are matters of speculation, no estimates were made of the military power requirements. Likewise, unless requirements of industrial establishments were known to be definitely a part of the utility system load, we did not make estimates of them.

One set of load estimates of the electric utility system requirements was designated normal and represents their need, based on conditions which would maintain the past rate of economic growth without major developments and programs which might bring about a radically different type of economy in the area. I think that probably it is a different type of economy in which the people of Alaska are primarily concerned. However, the estimates which we have designated normal, do not include any extraordinary increase in industrial use.

We also included what we termed "maximum and minimum estimates" to indicate the limits between which the total power requirements would probably range, should the population differ somewhat from that estimated, but still be within the range of possible growth based on past trends. The maximum estimates may be exceeded substantially, if certain industrial developments materialize at this time.

The basic assumptions considered in making the estimates of normal power requirements, cover those developments which could reasonably be expected to control the rate of growth in the 1960–80 study period. These are—I will not read these criteria; they are rather lengthy, but they will be part of the record if the committee so desires.

Senator GRUENING. They will be included in the record. We will be glad to have you submit them.

Mr. WING. They primarily are based on the estimates of normal growth. As previously stated, the future load requirements of certain nonutility powerloads originating in industrial and military establishments are assumed to be met by additions to the existing nonutility power supply. Therefore, the electric power requirements which have been estimated for the report published in 1960 are confined to those supplies which are expected to be made available by Alaska's privately and publicly owned electric-utility systems. The total future power requirements in the electric utilities in Alaska, estimated on the basis of normal growth and the economy are as follows:

The 1957 actual, the energy requirement in that year in round figures was 296 million, and the peak demand was about 67,000 kilowatts. In 1959 the energy requirement had increased to 345 million kilowatt-hours. That is a very substantial increase in a 2-year period. In 1960, the requirement is estimated as 383 million kilowatt-hours and I would not be surprised if that is exceeded. The corresponding peak demand would be around 86,000 kilowatts. The 1970 estimates are 837 million kilowatt-hours with 180,000 kilowatt demand, and in 1980, approximately 1,450 million kilowatt-hours and about 308,000 kilowatt demand.

The new capacity requirements of the utility systems in Alaska under normal load requirements, would reach about 75,000 kilowatts in 1970 and about 220,000 kilowatts by 1980. It is estimated that of this total, approximately two-thirds would be required in the Anchorage-Kenai Peninsula area.

Senator GRUENING. Well, we would be very happy to have the whole statement included in the record, Mr. Wing, if you so desire. We are getting near the noon hour. We have one other witness who is coming up to testify on the power needs of Wrangel, who was unable to get out of Portland yesterday, and we're going to hear him and Mr. Bloch and any others when we reconvene at 2 o'clock. I think that some of the folks here have luncheon engagements which they would like to keep. So I'd like to suggest one of two things: either that you continue your statement at 2 this afternoon, if you prefer that, or to include it in the record as presented, either one would be—whichever you prefer.

Mr. WING. Very well, I would be very glad to just have this included in the record, if that is satisfactory. I mean without reading it?

Senator GRUENING. Well, it would be available to everybody. I would like to ask you this question. You have no question, have you, about the impending power shortages in various parts of Alaska?

Mr. WING. No, sir; I have not.

Senator GRUENING. You feel that our desire for additional hydro development in various places where the power needs have been shown is a pressing need?

Mr. WING. I think so. There is, however, one difficulty. I think it has been brought out already. It is that many of these projects are very large when compared to the immediate needs and that is a hurdle that has to be cleared. But it is necessary to have to take a giant step once in a while and clear the hurdle—put the power in and then let the development of loads come a little later. I think that is quite proper, so long as the hurdle isn't too high.

Senator GRUENING. Hasn't the experience been invariably that the anticipated needs were always not sufficiently great and that subsequent events proved that the power generated for which there seemed to be no market was absorbed and utilized?

Mr. WING. That is true when the cost of power is low. That is, just putting in plants by itself will not develop the load. It takes some low-cost power. In other words, you have to attract industries which otherwise would not be attracted to an area by the cost of power that you might say is normally experienced in that area. Take something like the Crater-Long Lakes project. It would cost

about 6 mills per kilowatt-hour. You would get power from that project at about one-third the present cost. That project undoubtedly will in time develop industrial loads here which could not exist under higher cost power.

Senator GRUENING. Thank you very much, Mr. Wing. We will recess until 2 o'clock when we have several more witnesses to be heard, including the Corps of Engineers.

(The complete statement of Mr. Wing is as follows:)

ALASKA'S POWER MARKETS AND POWER RESOURCES

(By Lesher S. Wing, regional engineer, Federal Power Commission)

I have been looking forward to visiting Alaska for many years and was, therefore, delighted to be the one selected when Senator Gruening requested someone from the Federal Power Commission to present testimony on the powerloads and resources of Alaska. On previous occasions other men from our office have visited Alaska and surveyed its power market potentialities. Since I have never before been able to visit Alaska, I am now in the rather unfortunate position of having to discuss the power markets of an area which I have never seen. However, during the past 10 years I have followed closely our power market studies of this vast region and hope, therefore, that I shall be able to correctly interpret the statements and conclusions reached in our power market survey. A copy of our report will be submitted for your record.

It is impossible, of course, in the short period which I have to devote to this subject, to do more than present a brief summary of our findings and to give you some of the philosophy on which our conclusions are based. The problem of powerload forecasting is of fairly recent origin and one of constantly increasing importance. If we could glance backward to the time when Vitus Bering first sighted the Alaska mainland, we would also mark the first application of steampower to lighten the loads which humanity had previously borne. Prior to the advent of steampower the only assistance to man's muscle in performing his work had been that which he could obtain from wind, falling water, and domesticated animals. Steampower had two great advantages—it could be made available at any location and in any desired amount. It was these two factors which inaugurated what is sometimes termed "the industrial revolution," but steampower alone could not liberate man from the manifold daily tasks which only his own efforts could perform.

In 1884 Congress appointed the first Governor of the Territory of Alaska; this was just 2 yearts after Thomas A. Edison had proved the practicality of generating and distributing steam-electric power. Since that time the expansion in the use of electric energy has been at a rapid rate. This was made possible primarily by the development of long-distance power transmission techinques, which brought the benefits of cheap and plentiful power in a convenient form to almost every village and farm. It also made feasible the development of distant hydro projects to supplement the fuel-electric resources.

It is with these elements—power needs and power supply—that power market studies deal. The problem is essentially a two-part one; first, to determine the cost of generating and delivering power to the market by the most economic means; and, second, to estimate the kinds and size of industrial, commercial, and residential uses of power that will increase the usage as the result of the establishment of rates based on these power supplies.

In reaching the answers to this problem, we must consider not only population trends, the physical and climatic features of the region studied, but also the natural resources that may be exploited. These include its lands, forests, minerals, and scenic and recreational attractions, to name a few. When dealing with a region with vast undeveloped resources, such as was done in our Alaska surveys, it is important that the appraisal be made with broad vision and considerable optimism.

Our first power market survey of Alaska was made in 1947 and published in 1950. Our present report published in May of this year, like the former, was made at the request of the Corps of Engineers, division engineer, North Pacific division. Its primary purpose was to supply the division engineer and the Alaska district engineer with current information on Alaska's economy and electric power requirements and supply. This report provides up-to-date estimates of

future power requirements in the light of the probable economic developments, and appraises the extent of the market for power from potential hydroelectric projects.

Our review of Alaska's potentialities indicates that its minerals, particularly its recoverable natural gas and petroleum, exceeds all past expectations, that there is an increase in the number of sites where waterpower can be developed with some assurance of economic output, and that Alaska's forest resources are being increasingly utilized.

At present the use of Alaska's known mineral, forest, and wildlife resources is restricted largely to processing for export. The income produced is small in comparison with the value of goods imported. The amount of land being cultivated and producing falls far short of sustaining the needs of the population. The amount of expenditures by the military has, and will continue to have, an important bearing on the State's total economy. Great distances between producing facilities and markets and generally adverse climatic conditions, have seriously restricted Alaska's economic development.

ELECTRIC POWER IN ALASKA

In 1948, according to our previous survey, the installed generating capacity which could be accounted for in Alaska amounted to 70,600 kilowatts, of which 24,000 kilowatts were operated by electric utilities. The figure of 70,600 kilowatts was exclusive of a considerable amount of steam-electric capacity in major military installations, the size of which was not available at that time. In 1957 the total installed capacity was about 316,000 kilowatts. Of this total 104,900 kilowatts were in powerplants of the utilities, which is nearly 4.5 times greater than that of 1947. Forty-eight percent of this utility-plant capacity was hydroelectric. Powerplant additions scheduled and now under construction will by 1965 increase the capacity of Alaska's utility systems by about 45,000 kilowatts in new hydro capacity. This will make the total installed capacity about 156,000 kilowatts.

It is the power requirements to be supplied in the future by Alaska's electric utilities which are of immediate interest, and which can be estimated with some degree of assurance as to their reasonableness. Because the size of the military force and the type of installations which may be programed at any future date are matters of speculation, no estimates were made of the military power requirements. Likewise, unless requirements of industrial establishments were known to be definitely a part of the utility system load, estimates were not made.

One set of load estimates of electric utility system requirements was designated "normal," and represents their needs based on conditions which would maintain the past rate of economic growth without major developments and programs which might bring about a radically different type of economy in the area. The maximum and minimum estimates were made to indicate the limits between which the total power requirements would probably range should the population differ somewhat from that estimated, but still be within the range of possible growth based on past trends. The maximum estimates may be exceeded substantially if certain industrial developments materialize as a result of the availability of low-cost power.

The basic assumptions considered in making the estimates of the normal power requirements cover those developments which could reasonably be expected to control the rate of growth in the 1960 through 1980 study period. They are—

1. The Nation will engage in no major conflict, but international tension will persist.
2. The Nation's economy and employment will continue to expand.
3. Alaska's economy, under the stimulus of statehood, will stabilize, restrictions on use of its natural resources will be relaxed, and private investment will be encouraged.
4. National defense installations in Alaska will be expanded gradually and existing restriction on admitting dependents of military personnel will be removed.
5. The highway system will be expanded and new roads constructed on a statewide basis; highways entering Alaska's border will be improved; airports will be expanded; harbor facilities improved; ocean shipping increased; and transportation rates reduced.
6. Modern and greatly expanded trade and service facilities will encourage year-round tourism.

7. Mineral fuels will be discovered in sufficient quantities to justify significant commercial production, but Alaska will not become a major petroleum-producing area.

8. Significantly large ore bodies will not be discovered and developed for world markets.

9. Manufacturing industry will expand to supply a substantial portion of local needs.

10. There will be a substantial increase in new farm areas.

11. There will be a higher urban concentration of population.

12. Incomes will increase, housing will be improved, and living standards raised.

13. Educated facilities and health services will be expanded.

14. Power systems will expand and modernize, and electric rates will be reduced.

15. The power requirements of heavy power-consuming industries which might be attracted by the possibility of the availability of any large amounts of low-cost power have not been included in the estimates termed "normal," "minimum," and "maximum."

16. Fluctuations in the economy of the State due to the possibility of recessions and booms are not reflected in any of the estimates since they are representative of secular trends.

As previously stated, the future load requirements of certain nonutility power loads originating in industrial and military establishments are assumed to be met by additions to the existing nonutility power supply. Therefore, the electric power requirements which have been estimated for this report are confined to those for which supplies are expected to be made available by Alaska's privately and publicly owned electric utility systems.

The total future power requirements of the electric utilities in Alaska estimated on the basis of a normal growth in the economy are as follows:

Total Alaska power requirements

Year	Energy requirements (1,000 kilowatt-hours)	Peak demand (kilowatts)
1957 (actual)	296, 202	67, 467
1959	345, 491	
1960 (estimated)	383, 230	86, 055
1970 (estimated)	837, 938	180, 430
1980 (estimated)	1, 487, 385	308, 197

The new capacity requirements of utility systems in Alaska under normal load requirements would reach about 75,000 kilowatts in 1970 and approximately 220,000 kilowatts by 1980. It is estimated that of this total approximately two-thirds would be required in the Anchorage-Kenai Peninsula area.

Estimating future power requirements is not an exact science, since there are many factors that cannot be foreseen which will affect power use. This is particularly true of Alaska where many unpredictable factors could upset the direction of its future economic growth and thereby change the projections of historical trends. One of the many is governmental policy with respect to the development of its water and mineral resources, its harbors, and defense facilities. The suitability of industrial sites and transportation routes; the kind of agricultural and forestry programs; and a population growth greater than estimated; these are some of the important factors which could affect the economy of the State so greatly that its actual power requirements in future years would depart from the present estimates by a considerable margin.

Time may prove that one of Alaska's greatest resources is its abundant supply of hydropower. In 1959, only 70,000 kilowatts of the presently estimated potentional of about 18 million had been developed. Undoubtedly further and detailed surveys will uncover additional power sites, many of which will be developed to supply Alaska's growing power needs.

Because of the tremendous hydroelectric potential in Alaska, electrochemical or electrometallurgical industries which require large amounts of electric power may under certain conditions find it advantageous to locate at tidewater sites in the south coastal areas and utilize no small portion of the power from feasible

projects. Little information is available on the cost of developing power at the majority of Alaska's undeveloped hydroelectric projects, and, too, the investment in transmission facilities required may be considerable so that power costs at these industrial sites may not be substantially lower than in many other parts of the Nation nearer to established markets.

Illustrative of the size of Alaska's larger undeveloped hydroelectric sites, there are three of immediate importance with power potentials of well over 1 million kilowatts each. The largest is the Rampart Canyon site with an installed capacity potential estimated to be 4,690,000 kilowatts, located on the Yukon River about 85 miles northwest of Fairbanks. Another site is at Wood Canyon, with a capacity potential of 1,710,000 kilowatts, located on the Copper River 4 miles below its confluence with the Chitina River. The Taiya project located near Skagway has a capacity potential of around 1,600,000 kilowatts. Although the location of the Taiya site is at tidewater and is closer to the industrial markets of the States to the south, its development is contingent upon agreement with Canada on the diversion of water from the upper Yukon.

In addition to the potentialities of these major hydroelectric sites, various combinations of smaller projects could furnish large blocks of power. The group of three projects on the Susitna River with a combined estimated installed capacity of 1,310,000 kilowatts is an example.

Foreign interests are exploring the means to use Alaska's timber and mineral wealth to supply their home industries. The multimillion dollar pulpmill at Sitka, partly financed by Japanese capital, is concrete evidence of this interest. Four leading Japanese steel companies recently sent a survey team to investigate the extent of Alaska's iron ore deposits. Other Japanese interests are looking toward Alaska for coal and oil.

With the development of Alaska's extractive industries and improvement in the State's transportation system, important changes will occur in the region's economy. This would undoubtedly increase use of electric power in the State.

Other hydroelectric projects, although small by comparison with some of the major projects previously discussed, are of importance to particular localities involved. For example, a Federal hydroelectric plant costing about $40 million is being actively proposed for Crater and Long Lakes near the Juneau area. Its construction depends largely on whether the company now considering this location would build a pulp or newsprint plant and purchase 230 million kilowatt-hours of its annual 290 million potentially firm kilowatt-hour output. This hydroelectric project would not only diversify Juneau's government-heavy economy, but it would enable a large new industry to operate in the area. Thus utilization of one of Alaska's considerable water resources would bring about a use of electric energy in the Juneau area almost equal to that in the State during 1957.

The possibilities for utilization of power developed from any of the larger hydroelectric projects in Alaska are deserving of the attention of the chemical industry. Chlorine and caustic soda are important ingredients in the processing of lumber products, petroleum refining, oil exploration work, etc. To make chlorine electrochemically from seawater requires 70,000 kilowatts of high load factor power to produce 175,000 tons annually. A calcium carbide plant of about 50,000 tons annual production would use 155 million kilowatt-hours of energy annually with a peak capacity requriement of about 20,000 kilowatts. Investigation might reveal other chemical industries that would locate at tidewater points if low-cost power were offered.

If the Taiya hydroelectric project is completed, titaniferous magnetite ores from the Klukwan deposits near Haines could be developed. These deposits could also be a source of considerable titanium. A 100,000-ton steel plant to beneficiate these ores would require 75 million kilowatt-hours per year. Titanium production of 2,000 tons would require 80 million kilowatt-hours annually.

It is estimated that approximately 1.2 million kilowatts of additional generating capacity with an energy capability of over 5.7 billion kilowatt-hours annually would thus be required, should developments like these find a place in Alaska's future economy. These figures are illustrative of the magnitude of the industrial expansion required to further the development of Alaska's large hydroelectric power resources.

In the next two decades the number of undeveloped hydroelectric sites subject to economic development elsewhere in the United States will have substantially decreased. Thus Alaska's potential hydroelectric sites will become increasingly valuable. Their eventual construction will be a means to provide the additional

energy sources needed which otherwise would have to be provided by utilizing the country's diminishing fossil-fuel resources. Detailed studies will be necessary to determine actual power costs and to evaluate accurately whether they would be sufficiently low to attract industry of any magnitude.

On the basis of our most recent power market survey of Alaska, we have reached the following general conclusions:

1. The magnitude of an area's electric power requirements is, in general, determined not only by the degree of its industrial development, but also by the needs and size of its population. A farsighted and clearly defined developmental program to fully utilize Alaska's forests and its mineral resources should result in a large expansion in the State's basic industrial economy. This would bring about a sizable increase in population not only for that reason, but because of the satellite industries and commercial enterprises that would naturally arise in the wake of this forward industrial movement.

2. Barriers of topography and climate and relatively small loads will, in the main, discourage extensive interconnection of generating facilities. Opportunities for interconnecting systems will occur only in a few areas. Such possibilities do exist in the Fairbanks, Anchorage, Kenai Peninsula areas.

3. New developments might cause parts of Alaska's economy to expand greatly beyond that which is currently considered probable. In that event, the need for power will far exceed the additional requirements originally anticipated.

4. Although some large hydroelectric installations may be built for special purposes, it appears likely that most of the installations to be constructed will be of a moderate size to supply normal requirements in keeping with the local needs and to provide the most favorable economies.

AFTERNOON SESSION

Senator GRUENING. The meeting will come to order. We have a witness who is obliged to leave later by plane and so we will call on him first. He is C. Girard Davidson, of Portland, Oreg., former Assistant Secretary of the Interior, who will testify on certain aspects of the power situation, particularly as it affects Wrangell. Mr. Davidson, we welcome your presence here and we will be glad to hear from you on any or all aspects of this important subject.

STATEMENT OF HON. C. GIRARD DAVIDSON

Mr. DAVIDSON. Thank you very much, Senator. It certainly is a pleasure to be here and participate in the committees consideration of this very vital subject of hydroelectric development in Alaska.

I was Assistant Secretary of the Interior at the time that the studies authorizing the legislation for Alaska's only Federal hydroelectric project at Eklutna was prepared. But unfortunately I have not been in the position to keep very closely informed on the merits or the demerits of the various specific projects which you have under consideration at these hearings or the projects which have been under consideration during the past 10 years since I've been away from the Department of the Interior. Therefore, I think I will just attempt to outline a few general matters for your committee's consideration, based upon the experiences I had in the early thirties as a lawyer for the TVA, later as General Counsel for Bonneville Power Administration, as Assistant General Counsel for the War Production Board, and then later on as Assistant Secretary of the Interior, in charge of programing for the Pacific Northwest.

Senator GRUENING. That record really makes you well qualified to speak on this subject, I would say.

Mr. DAVIDSON. I think that will show you that I am not a complete stranger to the economy of Alaska. In the early fifties, I think it was, I was a member of a group that planned about $7½ million worth of developments in the Anchorage area. At the present time I am president of a company which is just now completing a sawmill operation in Wrangell—at a cost of approximately $2½ million. I would hope that the lumber market would go up soon so that this mill can provide some of the year-round employment which is so vitally needed here in Alaska.

I haven't had the benefit of attending the hearings at Anchorage or Fairbanks, so I hope that I am not repeating too much what has been said there. I fear that some of the points that I'll make are obvious, but perhaps they will bear some repetition.

Senator GRUENING. I think it was Justice Holmes, who said that sometimes repetition of the obvious was more important than elucidation of the obscure. So don't hesitate to repeat.

Mr. DAVIDSON. Thank you, Senator. I also think that because my experiences primarily have been in the Pacific Northwest, as you know, I have been a resident of Portland for the last 20 years, that you will pardon my references to that area. But, it may be that some of the lessons that we have learned in that "older frontier" will be of some help in the proper development of hydroelectric facilities in this "new frontier"—your 49th State.

With Alaska's hydro potential of over 19 million kilowatts of known potential power or 15 percent of the Nation's potential waterpower, questions, of course, naturally arise. Should it be developed and if so, why, and how much is it going to cost? But I would like to, for my own thinking, try to put this somewhat in perspective. And that is that we are having a tremendous population increase. We now have a population of 180 million people in this country, and by 1980, it is expected to be 260 million and 20 years later than that forecasts are that we will double our present population.

Alaska with its tremendous storehouse of natural resources is here at the crossroads of the world. With its tremendous land area, Alaska must, and I know that it wishes to assume its share of the responsibility, along with the other 49 States, of taking care of this increasing population. Accordingly, the standard of living which we Americans are becoming entitled to and hope to continue to create will reach higher and higher levels.

Now, those who live here in Alaska know that it is not a difficult job at all to get people to settle in Alaska. They want to stay here. Any time that someone comes up on a visit, particularly those who have had military duty here, they want to stay. But the great question always is: "Can Alaska provide the necessary employment, employment security to warrant moving one's family up here"?

I think we know that seasonal occupation—building construction projects for the military in the summertime and the fishing industry in the summertime—is not the answer. This brings me to my first point, which is obvious, that Alaska needs—and as fast as it can possibly obtain—low-cost power to provide stability for its economy through the establishment of year-round industry.

A flat statement can certainly be made that power is essential to the establishment of industry. And the cost and availability of power

determines whether the industry settles in a particular locality, whether it is going to settle somewhere else, or whether it is going to be established at all.

There is nothing in our system, thank goodness, which requires anyone to place an industry anywhere they don't want to; and when you are trying to decide whether you are going to locate in a certain area you take all factors into consideration. If you come out with a reasonable expectation of making a profit, the chances of putting it there are enhanced. If you can't you go somewhere else or just decide to hold onto the money that you've got and put it nowhere. This is what we are up against, and for this I would like to use the Pacific Northwest as an example, because low-cost power is essential to attract industry, and business does in turn attract people by providing employment.

Back in the last two decades, from 1930 to 1950, when Presidents Franklin Roosevelt and Harry Truman were in the White House, construction of dams on the Columbia River and its tributaries, which produced low-cost electric power, took place at a greatly accelerated rate. It was at that time that Bonneville, built by the Army Engineers, Grand Coulee by the Bureau of Reclamation, Hungry Horse, the Dalles, and other multiple-purpose projects were moving along fast. As a result, new industries moved into the region requiring greater labor forces and service industries.

During the period from 1940 to 1950, while these multiple-purpose dams were being developed and the power sold to industry, the labor force in the region increased 3½ percent in the Pacific Northwest. In the United States, as a whole, it only increased 1½ percent. But during this same period the population of the Pacific Northwest increased some 34.4 percent, as against only 14 percent increase in the United States as a whole. During this period diversified industry was established to augment the region's lumber and agricultural economy.

Since 1952, of course, Federal dam construction in the region has virtually stopped. Not a single new dam has been recommended for authorization or a new start made. And the results of this policy have been really disastrous to the region's economy. In 1952 the per capita income of Oregon was $97 higher than the national average. Only 5 years later, in 1957, we were $80 below the national average. To put it another way, since 1952 the per capita income of the United States as a whole has gone up 11 percent, whereas it has only gone up 5½ percent in the State of Oregon. This I attribute to a large extent to the failure to continue development of the Columbia River and is tributaries to provide a new base for industry to come in, and subsequent expansion of the base calling for employment and for electric power expansion.

Now during this 1930–50 era, the hydroelectric potential of the Pacific Northwest was being developed ahead of the markets to follow. This is extremely important for Alaska, because, as you know, we do not have industries up here now clamoring for power, as is the case in some other parts of the country. But both the TVA experience and the experience in the Pacific Northwest have proved that when low-cost power is available industry and business will move in and use it, and when it is not available industry will go to other

localities, and if the resources are not there, it will not be established at all.

I think it is very interesting in this connection that Bonneville Power Administration just announced a few weeks ago that it would release the first large block of power that has been released, I think, for at least a period of 5 years, and it was immediately snapped up. I think it was within 2 weeks after the announcement was made that a new paper plant was announced. Two new aluminum plants and one expansion of existing facilities were also announced. This is in spite of the softness in the aluminum market. New plants were announced immediately with investments to the extent of $75 million of new plant construction beause this block of power was there.

Now, therefore, we urge this committee to do everything it can to have construction started as promptly as possible on hydroelectric power development in Alaska.

I'll admit Senator, I feel self-conscious about saying this—with you presiding—because there has been nobody in the State of Alaska who for years has fought so hard to get this very thing done as have you. We are all very happy that you are now acting chairman of the subcommittee because we feel you will be in a much more effective position to push this program.

Senator GRUENING. Thank you, Mr. Davidson; we still have 99 other Members of the Senate and 437 Members of the House to persuade.

Mr. DAVIDSON. Hydroelectric power expansion is necessary to national security. The availability of low-cost power on the Columbia, of course, resulted in large segments of the aluminum industry establishing in the Pacific Northwest, in order to provide the planes that were necessary for World War II and other metallurgical developments vital to the national defense as well as facilities used in making atomic bombs that required large and dependable supplies of electric power.

But I think, as you have pointed out many times, we are at present not keeping up with Soviet Russia in developing hydroelectric power. Russia has increased its power potential at a tremendous rate and the 4 to 1 advantage which we had of capacity over Russia in 1948 has already been reduced to 3 to 1. Of course, they have under construction and completed five giant dams, each of which has 2 to 4 times the capacity of our largest, Grand Coulee. The power potential of hydro in the United States is something like 113 million kilowatts and that of Soviet Russia is something like 830 million kilowatts. This is why to me it is just incomprehensible that, even when our power potential is so greatly under that of Soviet Russia, we can permit the debauchery of the Hells Canyon high dam site where we lose hundreds of thousands of kilowatts from the Columbia and Snake Rivers in order to satisfy a private power company.

But this brings up another point, and one which I should certainly commend the Congress in its wisdom for having this study of the power potential in Alaska made at this time, because Alaska is now relatively undeveloped as compared with the other 49 States. At this time proper planning can be undertaken to develop and use the best low-cost hydroelectric sites. I think when these sites are selected, even in a preliminary way, and they look like good sites,

that something ought to be done to withdraw them or to preserve them so that other activities can be planned around these sites as though the dam were already built. I refer to the construction of roads and bridges and other facilities. I say this because failure to do these things might forever preclude the construction of an excellent project. For example, I think you are certainly familiar with the project in the State of Montana, Paradise Dam, where we would have an excellent damsite which would produce very low-cost power if the dam alone could be considered. But, whether Paradise Dam is feasible or infeasible economically depends almost entirely on the huge cost of relocating a railroad which would be completely inundated if the dam is constructed.

Senator GRUENING. I might say in that connection that I held the hearings on the Knowles and Paradise Dam projects in Montana a year ago. The conclusion was reached for the very reasons that you pointed out, that Paradise Dam was uneconomic and that Knowles Dam, which has less production of power, would have to be built. This was simply because of the great cost involved with the relocation of railroads that would be necessary for the Paradise project. So your point is very well taken here, especially in Alaska, where we are still in our beginnings as far as highway construction and so forth is concerned. So we are well advised by you to anticipate that situation and not let it happen here.

Mr. DAVIDSON. This is why I am so happy that the committee is now going into this, because I think you can preserve these sites at this point. Of course, we all know that hydroelectric power is a good financial investment for the people of the United States. And that all the power costs are repaid to the Government with interest, and all additional revenues are turned over to the Treasury to aid substantially in helping to pay the costs of other uses, such as irrigation, navigation, flood control, and so forth. For example, I know the construction of Grand Coulee Dam made possible the Columbia Basin irrigation project of 1 million acres. As I recall, in addition to paying the power cost, power absorbed about 80 percent of the cost of the reclamation project, and that 1 million acres of land which will be irrigated corresponds in size approximately to the area of the State of Delaware. All this is being done with the help of power revenues, and this is certainly something which helps the economy of the entire United States considerably.

In closing Mr. Chairman, let me reiterate one point, and that is that the construction of power facilities must come in advance of commitments for the power. I think for those who only have partial familiarity with the problems of construction of hydroelectric facilities, it seems so logical to say, "Let's wait until we have an industry or business to use the power capacity, and let's build the facilities when the Government runs no risk of the loss." This isn't the purpose or the role of Government in fulfilling its responsibility to its citizens.

It is the responsibility of the Federal Government in areas such as this, to do the necessary planning, to look ahead to see which area is the logical location for industrial enterprises, taking into consideration its natural resources, the transportation potential, the transmission distance from the dam sites to load centers and so forth. Then

after they determine these factors, then proceed to do everything it can in its power to get the job done. This was the approach that was taken in the TVA, at Bonneville Dam, at Grand Coulee. The public took the risk of power investment in anticipation of the load. The skeptics, you remember, predicted that Grand Coulee power would not find a market. The hue and cry then was that there would be no one but jackrabbits in the deserts of central Washington to use the kilowatts from that great structure, the biggest dam the Federal Government has ever constructed. But the record shows that Grand Coulee power never lacked for a market. As the power became available, the industries were there to take it and use it. They used it to run their plants, to create jobs, to develop this competitive free enterprise system of which all of us are so proud and which we will fight to the end to preserve.

The validity of this approach, Mr. Chairman, has long since been proved, and I feel confident that, with the great assistance of your committee, low-cost power, provided promptly in advance of market, will accelerate even faster the continued growth of this great 49th State.

Senator GRUENING. Thank you very much Mr. Davidson, for your very useful and very constructive presentation. This very question arose this morning in a discussion in connection with the building of the Crater-Long Lake division, Snettisham project. We are confronted, for your information, by the plea on the one hand that the company wanted this power without a commitment and the expression on the part of certain agencies of the Government that we couldn't have this development until we got a firm commitment. I would say for the record, that I think the experience in the Pacific Northwest demonstrates completely, your point of view. Never in recent years, since the development of electricity by hydro has there been a lack of markets when a dam was built. I have no doubt whatever, that that will be the situation here and our objectives are going to be to try and persuade the Federal agencies, executive and legislative, to take that point of view because I am confident that by doing that we would save a great deal of very valuable time and speed the development, which is our objective. I think that even those who are committed through the procedures of Government not to commit themselves too definitely, know that to be so and sympathize thoroughly with that point of view.

The experience that you point out of Grand Coulee, Bonneville and all the rest, is certainly going to repeat itself here, and what we're trying to do is not to wait until we get firm commitments which we are so much less apt to get before we have the power, but which I feel, as you do, that we are certain to get once the power is available. So your presentation has been right on the nose and very useful. Thank you very much.

Mr. DAVIDSON. Thank you.

Senator GRUENING. Ivan Bloch, you have waited very patiently for a long time, but I know that it is worth waiting for. Mr. Bloch is an expert in this field. Not merely in general but particularly in Alaska, with which he has been closely associated for many years in many varieties of power developments and their associated benefits.

Mr. BLOCH. I would like to say that I have had the great privilege of working with the Assistant Secretary, Mr. Davidson, for a number of years and that his observations have never been put in more succinct and completely correct language. I think it is unfortunate that some of the statements which have been made before this committee, with, I am sure, the utmost sincerity, deny the incontrovertible fact that power availability precedes and then geometrically stimulates development. As Mr. Davidson has pointed out, the experience of the Pacific Northwest—of which I was fortunate to be in the so-called front trenches—and other parts of the world, have demonstrated this I think without any possible doubt. Even in Alaska, in the Anchorage and Fairbanks areas, the expansion of rural lines by Chugach Electric Association and by Golden Valley Electric Association, have in effect caused those areas to develop. As those lines were extended to boondocks—if you please—people moved into the boondock areas.

As long as we have a philosophy of trying to wait for markets to develop on power, I can only conclude that Alaska's growth will be more than seriously handicapped, and I suspect that the national welfare and security will be greatly impaired. As you know I have had some background in the power field, especially in those peculiar industries which consume power in very large quantities. As I have already entered into the record, I have assisted in the analysis and location of some eight aluminum plants, three ferroalloy plants, two calcium plants, one chlorine plant, one abrasive plant and various others. These are peculiar industries, in that electric power in them is a raw material, as against the use of power in other industries where it merely serves to turn wheels. Because of the peculiarities of those industries, they seek and must have extremely large blocks of firm power at extremely low costs. I have already introduced into the record some figures showing the fabulous requirements of those industries, such as the aluminum plant, producing say 20,000 short tons of metal a year, which requires about 45,000 kilowatts of capacity and consumes around 300 million kilowatt-hours. If we compare it to the Crater-Long Lakes division project and look at the total kilowatt-hours produced, I think it comes pretty close to just satisfying one small aluminum plant, assuming the price were right.

As in every industrial process we are always looking for the balancing out of costs in order to provide for a profitable enterprise. In the case of the electroprocess industries, the two major components of cost are those of power and those of transportation. We must balance the costs of transportation of raw materials to the electroprocess plants and transportation of the finished product to the markets, with the power cost as a component of production.

It has been so frequently said that it's becoming just a wee bit nauseating, if you will pardon the expression, that Alaska is so far removed from markets that even low power costs will have little if no effect. I think I could categorically and specifically deny that allegation, but I don't know that this is the time to do it—it takes a lot of arithmetic. The face remains that the total growth of the electroprocess industries in the United States, and in the world for that matter, has been at a rate far exceeding the normal growth of industry. The aluminum industry has been growing—if my figures are correct—

at a rate of about 10 to 13 percent per year. The elemental phosphorus industry has likewise been growing at tremendous rates. The reason for these rates of growth is that these industries provide materials that are basically a pyramid to the rest of industry. In effect without a healthy electroprocess industry to which power supplies are constantly and abundantly made available, I believe that the whole structure of industry thereby suffers. The examples can be specified and categoried.

I've made some studies recently of the potential growth of electroprocess industries by the year 1985. I realize that forecasting the future is always a hazardous process, but I believe that I've been conservative in my estimates and taking just a few of these major industries, which list I have placed already in the record, find that some 40 million kilowatts of power will be required for some dozen of them, of which aluminum accounts for some 27 million kilowatts of demand by 1985. Whether I am off by 5 years one way or the other, I don't think is too material, since the amount is so astronomically large.

Now if we try to analyze the places where this power may be available, I think we would find ourselves with a deficit situation. Part of the demand can be met through very large thermal powerplants in the Ohio Valley, although they provide power at costs somewhat in excess of those which, for example, prevail in the Pacific Northwest of 2 mills per kilowatt-hour. These have the advantage of being in the midst of the major consuming markets. Considering the inherent physical limitation on the coal deposist in that area and the mineability of the coal as such, possibly 2 or 3 million kilowatts could yet be developed in that area. This is a drop in the bucket in terms of the total requirement of the electroprocess industries.

The Rocky Mountain coal area, with its vast subbituminous and lignite coals, can provide another region for the development of large quantities of relatively low-cost power. But unfortunately that area is distant from tidewater, providing ready access to raw materials of the world, or to the markets of the world through navigable routes. In other words it is an area which is isolated from the point of view of water transportation, which is very important. So that I believe, although there will be development in that area, it will be at a somewhat leisurely pace as against some other areas which still have considerable hydro potential.

Again depending on the policies which will influence the development of the Columbia, its tributaries, the Snake, as well as the Canadian portions of the Columbia, I believe that perhaps 3 or 4 million kilowatts, could be made available for electroprocess industry—at power rates which, combined with the transportation advantages of that area, either the Columbia River or the coastal areas will make possible the establishment of these industries. In substance, when we add up the pluses and the minuses, we find, or at least I find, a deficit by the year 1985 of possibly on the order of 14 million kilowatts. Alaska's hydropower resources have been estimated at about 19 million kilowatts; of course, that includes the cats and the dogs and the good ones.

On the basis of information which has been developed by the Corps of Engineers and the Bureau of Reclamation, it is my feeling that certain projects certainly are outstanding as to their immediate at-

traction for electroprocess industry development. They are the Taiya project, Rampart, Wood Canyon, and possibly some others on which investigations have not yet been completed. But I think the measurement of feasibility for electroprocess industry establishment outside of mere size and availability of large blocks of firm power will be the price range. I think that we have got to be realistic, that if we get outside of the 2- to 4-mill range we're not going to be in the ball park and in that I am using a timespan of say the next 15 to 20 years.

The transportation of raw materials to electroprocess industry is an old story. The Swedes, when they started their first hydroelectric plant, brought in their alumina from such sources as France, Yugoslavia. Today, the U.S. aluminum industry obtains its supplies from the Caribbean area, from the north coast of South America, and from the Gold Coast or West Coast of Africa. One plant at least in the Pacific Northwest obtains its alumina supplies from Japan. Kittimat, which after all is close by here, obtains its alumina from a plant in the midst of the bauxite deposits of Jamaica, West Indies.

The metal is transported equally long distances, so that the hazard of transportation is not as great as it would be in other types of industries. The fact remains that the electric power component of the electroprocess industry is the controlling component.

Now, I would like to refer again to some of the discussions before this committee in the last few days to the effect that Alaska's power resource development in effect, must be related to its forest and mineral resources. I think that we have got to remember that this power in Alaska, in itself, is a raw material; also that its utilization will not necessarily depend on the development of either bauxite in this area or alumina-bearing materials, but that power of itself is an urgently needed resource. There again, if we wait for hard and fast expression of interest, all we are going to be creating is some more Gordian knots; we are not going to be cutting them. The process of industrial development by wealth-creating enterprise is complex enough without making it even more complex by holding tantalizing power projects on an "as-if-and-when" basis. And if my background of 20 years of experience is worth anything, power availability in advance of actual need is a cardinal principle, not merely for Alaska, but for anywhere else in the world.

Sure it takes risk, but I think that it could be stated adequately, that every day is a risk. As Mr. Davidson has stated so eloquently, it is a responsibility of the people acting through their Congress and through the administrative branch of Government, to do some of the things which they individually cannot do. These are to provide for employment, to provide for security, and until that principle is really taken to heart, I just don't think Alaska will get off the 19th century and come into the 20th. In order to transform this pioneer country, this country which at this stage of the game is not even in the middle 1800's, to transform it to part of the "jet age," so to speak, is going to take tools, and power is one of them.

Thank you very much.

Senator GRUENING. Thank you very much, Mr. Bloch. I take it that you agree with Mr. Davidson, that you would register a slight dissent from the Commissioner's idea that we have to have the incubator after the agency lays the egg in order to produce the chicken. Do you think the egg will hatch by itself?

Mr. BLOCH. I regret to disagree with the Commissioner.

Senator GRUENING. Thank you very much, Mr. Bloch.

The Snettisham development project here is a Reclamation project and the Corps of Engineers is not directly concerned. But, of course, both these agencies have a concern for all power development and I wonder whether in reviewing our hearing, and summing up from the standpoint of the corps, without particular reference necessarily to its own projects whether Colonel Hanburger would like to make some comment on the overall situation as he sees it. Colonel Hanburger is the recently appointed district engineer for the corps and I think Alaska is very fortunate in having him.

STATEMENT OF COLONEL HANBURGER, CORPS OF ENGINEERS

Colonel HANBURGER. I am Col. Christian Hanburger, the district engineer of the Alaska District Corps of Engineers. In 1951 and 1952 the corps prepared what is known as Interim Report No. 1 on Southeastern Alaska. This report was prepared with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power, and related water uses under authority of the Flood Control Act of 1948, as amended.

As a result of this study, several navigation and harbor projects have been constructed and one is scheduled for construction in the near future. In addition to the navigation, harbor, and flood control investigations, the corps made an inventory of some 83 potential powersites. These studies were of preliminary nature and did not go into details of foundations, type of structures, and other normal damsite investigations. Interim Report No. 1, now published as House Document No. 501, 83d Congress, 2d session, lists those sites under the following four general areas:

	Projects
Ketchikan area	29
Petersburg-Wrangell area	14
Sitka area	21
Juneau area	19

The total potential for prime power development at these sites was estimated to be about 395,000 kilowatts. Based on these limited studies made about 10 years ago, it appeared that in the Ketchikan area the Lake Grace site was the most feasible. In the Juneau area, our studies indicated that the most favorable project was Long Lake-Crater Lake, involving the same water resources proposed for development in the Bureau's Snettisham project. The Dorothy Creek site also appeared to have good possibilities.

Unlike the Cook Inlet area and the Tanana River Basin, southeastern Alaska was comparatively unaffected by the vast military construction program. It had, instead, experienced a rather slow, steady growth based upon the development of natural resources. When Interim Report No. 1 was prepared, this area did not have the heavy demand for power that was experienced elsewhere. Therefore, the most feasible way to meet new power requirements appeared to be development of one or more of the available hydroelectric sites. Under the normal rate of growth of powerload, it also appeared that the local power companies or municipal utilities could probably assume the responsibility for additional projects as the need arose. Our

report did, however, state that if the power demand increased beyond the ability of local finances, the expenditure of Federal funds would be justified.

Since completion of this report, the Corps of Engineers has made no further studies regarding the hydroelectric power needs or potential sites in this area. In summary, I wish to state that, based on our limited knowledge of this area, the Snettisham project appears to be the most suitable for immediate development. Although the Snettisham project varies slightly from the Long Lake-Crater Lake plan considered in our 1951 report, it appears that we are in complete agreement as to its feasibility and desirability for development to serve the Juneau area.

Additional studies would be necessary before the Corps of Engineers would be able to make further definite recommendations.

That is all I have of the prepared statement, sir. Mr. Moats and I will try to answer any questions you might have.

Senator GRUENING. Well, of course, we have had a rapid but pretty comprehensive review here now of the power needs of at least the principal areas of Alaska, but it is by no means complete, and it hasn't gone into many of the smaller areas that may need power. I wonder whether you would have an opinion on the views expressed by former Secretary Davidson, on the desirability of moving ahead, even before you have absolutely firm committments for marketing this power. What would be your view based on your experience, here and elsewhere?

Colonel HANBURGER. This would have to be, of course, my personal opinion, and I may say that I feel that I bring a fresh outlook to Alaska—in that I have been here such a short time—I haven't been able to be influenced by one side or the other.

From what I have heard at the power hearings, it appears to me that the power is necessary before the industry can be developed. In the same way that you many times hear people say that it takes money to make money. I believe that here we could say "It is going to take power to make growth." We can't predetermine exactly what this growth will be, but I hope that our economic survey (and this is the survey I speak of in connection with Rampart) will definitely point to the areas that if the power is available that it would be economical and desirable for such industries to locate in Alaska.

Senator GRUENING. Thank you very much Colonel Hanburger. Mr. Moats would you like to add anything?

Mr. MOATS. I think that the colonel has very well stated the key. I am a little suspicious and gratified though, because he has joined "We Alaskans" very rapidly.

Senator GRUENING. That is no cause for suspicion, that is merely a demonstration of intelligence.

Commissioner Dominy, I know that you have a pressing engagement elsewhere, one that certainly needs to be kept, but before we adjourn this session, is there anything further that you desire to say?

FURTHER STATEMENT OF COMMISSIONER DOMINY

Commissioner DOMINY. I am Floyd E. Dominy, Commissioner of the Bureau of Reclamation. I would like to make it abundantly clear

that the differences of views that have been exchanged before the distinguished Senator from Alaska during these very worthwhile hearings in the past 2 weeks, in my judgment, are differences in degree only and not a difference in fundamental recognition of the economic fact that you certainly must have power before you actually can have the industrial growth that we are all seeking for Alaska.

The point of view which I have been attempting to express is very simply stated, I think, in this fashion: that it is my judgment as an economist and as a Federal administrator of some 27 years' standing—while I now hold a position which I must admit is referred to as that of a "political executive," I obtained that position through the career service and, while as a political executive I must submit to the rein and bit and guidance of the administration to whom I am directly accountable and through it accountable to the Congress and to the people I, nevertheless have personal opinions and personal views based on my years of experience in dealing with western water resource development. It is my personal conviction, sir, that to anticipate early and prompt developments at this stage of Alaska's growth of a Federal undertaking involving some billion and a half dollars, to create a potential power producer of upward of 5 million kilowatt capacity when the railbelt area is only now consuming a little over 200,000 kilowatts of capacity, is unrealistic. I consider that to think about building Rampart now, at this stage of the Alaska economy, would be similar to have thought about building Grand Coulee in the Pacific Northwest when the Oregon Trail was still being traveled by covered wagon and the population coming from east of the Missouri River to the Pacific Northwest.

Senator GRUENING. When the Oregon trail was being followed, there wasn't even transmission of electricity over wires.

Commissioner DOMINY. Yes; that is true, and to that extent the example is of course exaggerated. But I feel that any project that can reduce the present terrifically high power cost down to the range of 6 to 8 mills, for example, that can be built without the tremendous expenditure involved in a more massive project, and that could be completely utilized over a reasonable period of time should not be overlooked at this stage in Alaska's development. Now, as I say, this to me is an expression of a degree of difference and not a complete difference among myself and the other witnesses.

Senator GRUENING. Well, let's analyze your thought. You think that Rampart should not be built now but the Devil Canyon should be. Now Devil Canyon will cost almost half a billion dollars. Rampart will cost a billion and a third. Devil Canyon will have an installed capacity of 500,000 kilowatts. Rampart will have 5 million. Rampart will produce at 2 mills. Devil Canyon at 6 or more. In other words, you would sacrifice a power cost of at least 4 mills and tenfold capacity for a difference of perhaps 1⅓ times the cost. Do you realize—and I think you must—that it would be no more difficult, or probably not much more difficult, to get Congress to appropriate $1⅓ billion than it would a half a billion considering the difference in the two projects?

Commissioner DOMINY. Well, let me say first of all that we have not finalized the Susitna River Devil Canyon report, and I am not in a position to say that as Commissioner I will recommend its construction at this time. Or that the Department, if I do, will endorse it or

that the administration will submit it to Congress as a recommended project, even if the Secretary and I find it worthy of consideration.

Secondly, that project has been engineered; the drilling and other engineering and economic details have been accumulated so that we can come up with a firm figure as a basis for judgment. That cannot be said at this time for the Rampart proposal. I certainly do not oppose the studies of Rampart. I certainly agree with Ivan Bloch and former Assistant Secretary Davidson that it would be highly desirable to protect that site under power-site withdrawal and to avoid, at all costs, any developments that would tend to make infeasible the future consideration of that great potential.

Senator GRUENING. Well, I couldn't anticipate what the Congress would do but I think it is fairly reasonable to assume, that if Congress authorized Devil Canyon at a cost of half a billion dollars, which would have 500,000 kilowatts installed capacity of 6 mill power, it probably would not authorize Rampart, but the question is which in the long range is the better deal for Alaska. And I agree with you that the reports have not yet been completed on Rampart, but I think the essential thing is now to push forward and get those facts so that we can weigh the comparative value of the larger projects with which we know we will have to deal after the smaller projects are completed.

My thought in asking this question was rather in connection with the Snettisham project. If you can forget for a moment that you are a Government official, I would like your personal opinion: Do you feel that we should not go ahead with Snettisham unless we got a firm commitment—not in your official capacity but in your personal capacity?

Commissioner DOMINY. Well, I would like to say first of all, Senator, that the Bureau's investigation of Snettisham was based not upon the immediate needs of the area, nor upon the immediate projected growth under its normal, historical growth of the area, absent the introduction of a specific industry. The whole report was premised on the expectation—the reasonable expectation—that this industry was available. And could economically be developed under today's cost-price relationship for that industry, if a power supply were available in the 6 mill range, and we have had encouragement from a recognized responsible company to proceed on that basis. I do not consider it unwise to limit the authorization—if the Congress authorizes the project—to make clear that it supports the judgment of the Commissioner and the Secretary of the Interior that this is a desirable project for Federal participation but limits the actual construction of the project to such time as a firm commitment for the utilization of the major block of the power is at hand. Our project report, even with the Georgia-Pacific Alaska Co.'s use, still reserves for normal local load growth a substantial quantity of power.

Senator GRUENING. I should want to examine that statement fully. I suspect that when Snettisham is built and you get the Georgia-Pacific, you will be short of power with that project within a few years and you will have to develop other additional sites such as Lake Dorothy and Speel River.

Commissioner DOMINY. That may be true and we have contemplated that those additions could come on the line very feasibly, if the base project as recommended, is constructed.

Senator GRUENING. Of course, there is a difference of philosophy here. Under the Roosevelt administration, Franklin Roosevelt ordered Grand Coulee built and events rapidly proved the wisdom of his judgment. This administration would, if it approves this project, as I understand it will, approve it conditionally provided we have the assurance first of a power market. It is a difference in philosophy. We developed TVA and Grand Coulee and Bonneville, all on the assumption that industry would come and that assumption proved justified. This administration takes a more conservative view, and I think that your testimony is along that line. Is that not correct?

Commissioner DOMINY. Yes, I think it is. As I pointed out earlier today, we do not have an economic condition prevailing in the United States such as prevailed when TVA and Grand Coulee were considered and were authorized.

Senator GRUENING. Of course we are living in a period of a very rapid change. When you began your career in Government, you would have considered it fantastic to think that two dozen space vehicles would be circling the earth. Various other changes have come, and I suspect that our rate of growth and development will be increasingly accelerated, and that most of our estimates today are unduly conservative.

Commissioner DOMINY. I think that is a true statement, Senator.

Senator GRUENING. Thank you very much.

Commissioner Holdsworth, you have listened to all these hearings and you have a very vital interest in them and in their implications, I wonder if you have any comments to make?

STATEMENT OF COMMISSIONER PHIL HOLDSWORTH

Mr. HOLDSWORTH. Yes, Mr. Chairman, I would like to make a very few brief comments. For the record, I am Phil Holdsworth, commissioner of natural resources for the State of Alaska.

Although my remarks will be much briefer since the testimony of both Mr. Davidson and Mr. Bloch, you directed a suggestion to me earlier today at the hearings, that the State might set up a proper body to possibly act as the arm of some sort to negotiate on these power proposals. I will leave copies of chapter 135, SLA 1960, establishing a section of power development within the department of commerce, with this committee. This section was given the power to fulfill this function, but unfortunately the legislature did not at the same time, provide any appropriations under which it could operate.

(See appendix of this hearing for this exhibit.)

Senator GRUENING. That sometimes happens in legislative bodies on the Federal as well as on the State level.

Mr. HOLDSWORTH. I would like to read about three sentences in the act, which I think fulfill the requirement which you suggested this morning. This is section 4 of the act:

> In addition to all other powers and duties conferred upon the section by the act, the section shall make a careful study of all laws with the administration of which it is charged and of the practices of State power authorities and similar agencies elsewhere and make a special written report thereon, including recommendations for such further legislative action as it may deem necessary in the public interest. More specifically, such report shall include recommendations with respect to the State's need for a corporate arm with the authority to construct and otherwise acquire, operate, and maintain electric generation,

transmission, and distribution facilities, and to produce and otherwise acquire, transmit, distribute, furnish, and sell electric power and energy and other incidental services, commodities, and facilities, and the ways and means of financing such activities.

I believe that is exactly the function which you suggested this morning. The legislature saw fit to provide for the authority but unfortunately no appropriation. This act provides that the section on the power development, make a special report to the Governor 10 days prior to the convening of the second State legislature and also a copy to the president of the senate and the speaker of the house, within 5 days after it convenes.

I rather doubt with the limited appropriations that the commissioner of commerce has been granted, that he will be able to provide a report. Certainly he will have all the assistance that he requests from the other agencies involved.

Now as I mentioned before, my remarks will be much shorter than I had anticipated after listening to these hearings. These remarks should not be considered in any way as criticism of the agencies which are administering the power functions of the Federal Government at this time. We must realize that they are operating under policies and appropriations under which they make feasibility studies and construct projects and under long-established policies, which they themselves may have no control over. It is our plea that this committee do what it can from the congressional standpoint, to influence some change in these present policies. I will have to agree with the testimony of both Mr. Davidson and Mr. Bloch, that if we are to develop this area which we might call "the last remaining major source of cheap hydroelectric power," that power must be available ahead of committed industry participation.

Referring to Mr. Bloch's testimony, if we must (and I believe myself we must) consider these projects which will deliver power in the 2- to 4-mill range, industry is going to be attracted but it should indicate the projects which should be considered first. These projects which will deliver that type of power will provide it in such a large block that it is unlikely that any one industrial development will consume that entire block. It will be very difficult to get many industries to commit themselves all at one time to come in and utilize that power. All we can do is look at the past history as Mr. Davidson pointed out, and see what has happened in other areas. When low-cost power is available, industry comes in and uses it.

There is the raw material which we have and can be developed. Labor can be imported, raw materials can even be imported to use that power. We believe we have many raw materials in Alaska, which can become an important factor in the use of that power.

Senator GRUENING. I think you realize that when we were discussing the question of getting the Federal Government to advance money for projects such as Snettisham, I am told that we must have a prior commitment. We should note that the Federal Government is asking the taxpayers of America this year to spend $515 million to develop the Indus River, without any prior commitments on the part of the Governments of either India or Pakistan. Similar hydroelectric projects are going in all over the world without commitments, either by means of outright grants or as loans repayable in soft currencies which are the equivalent of grants as experience has shown.

Therefore, the Government would be merely treating our own people as well as they treat the foreign governments if it adopted such a policy in Alaska.

Mr. HOLDSWORTH. That comparison was drawn out in Governor Egan's remarks this morning.

Senator GRUENING. Thank you very much.

Commissioner Romick, seeing you are to be charged with the responsibility if and when the State legislature gives you some money, wouldn't you like to make a statement?

Mr. ROMICK. I have no statement Mr. Chairman, at this time.

Senator GRUENING. Well then, come forward and make a few informal remarks then. We are very happy to have you here, Mr. Romick.

STATEMENT OF A. H. ROMICK, COMMISSIONER OF COMMERCE

Mr. ROMICK. Thank you Mr. Chairman. I am A. H. Romick, commissioner of commerce of the State of Alaska. I feel that in the next session of the legislature we will have an appropriation to carry out chapter 135 for power development. The public service commission also will perform research in regard to the regulations of public utilities. I was unprepared to make any kind of a statement written or oral at this time, having been absent from the city until yesterday afternoon. I would be happy to answer any questions.

Senator GRUENING. I would like a suggestion in view of the testimony that we have had at these hearings that there are a number of distinct functions which the State might explore. One is the question of a power authority which would operate some of these projects after they are completed. Another one is the function of cooperating with the agency that is engaged in building these, in getting the necessary economic and other data. You take the case of Rampart for instance, there is probably no agency in the State government which is not going to be concerned. There is going to be an important land problem in connection with the new physiography of the landscape when a lake with 10,000 square miles of expanse is created.

There is the question of the resources which now exist which will be flooded in the course of 20 years after the dam is built. The mineral and timber resources—something will have to be done with them. That involves the department of resources. Then you have the question of the relocation of those communities that will be flooded out and that is a problem that I think would involve the department of education, the agency of the rural rehabilitation and the department of health and welfare, and so on and so forth. So practically every State agency will be involved and I would hope that the State would create an agency that could collaborate with the Corps of Engineers and Bureau of Reclamation in planning these drastic and important changes and see how they affect the people involved and the resources involved and assist the Federal agencies in making the studies.

Mr. ROMICK. Mr. Chairman, I would like to comment that the department of commerce, the division of tourism and economic development will be vitally interested in any power development. Without power, it would be a foregone conclusion that outside capital will not come in. This is particularly true in the highway areas where we are so badly in need of facilities for tourists that are coming

through by car. This observation applies to all the tourist centers of Alaska—the southeast as well as the Fairbanks and Anchorage areas.

Senator GRUENING. Also, wouldn't the State department of fish and game have a vital interest in both what might happen to the anadromous runs up the Yukon and also in the potentialities of this new lake?

Mr. ROMICK. I believe they would. In a recent survey that we have made for a company interested in the location of a cement plant, we find that in order to follow through in this particular area there will be power needed. That was a recent survey on which we spent considerable time in research and analysis.

Senator GRUENING. Thank you very much, Commissioner. Before we close the hearings, I would like to suggest to former Secretary Davidson that we would appreciate a statement from him as to the additional power needs in Wrangell. We invited representatives of the other southeastern communities, Wrangell, Petersburg, and so forth, to present testimony but they have not come in, but we do not want to see them neglected. I shall communicate further with them, but we would appreciate any statement that you would care to supply, not necessarily now but before the record is closed, on the subject of Wrangell's needs.

FURTHER STATEMENT OF HON. C. GIRARD DAVIDSON

Mr. DAVIDSON. Thank you Mr. Chairman. I would be very happy to do that and we will submit a statement for the record. I would like to say, for the benefit of those that are present, that in construction of just a sawmill at Wrangell, the power facilities represented one-fourth of the entire construction cost of the project. Now of course we will have to have far greater power capacity when we have to put in a pulpmill by 1965, I think it is. Now even if the Federal agencies started today, it takes 3 to 4 years to build a project. We therefore have to assume that no Federal power will be available by the time that our contract requires us to build and complete a pulpmill. The fact is that it is difficult to raise money. It means seeking additional capital which we will have to raise in order to take care of power needs and that may make the whole project infeasible. This is why if there is any possibility of getting a very realistic report it should be done. I hear that they have studied 14 projects in the Wrangell-Petersburg area. I hope that they have found one that will be feasible.

Senator GRUENING. Is your company obligated to build a pulpmill?

Mr. DAVIDSON. We are not obligated. We are to pick up the remaining 2¼ billion feet of timber under the contract. We are building the sawmill. We have three-quarter billion feet that we can cut now, and before 1965 we are supposed to build the pulpmill. We are now, of course, studying the feasibility of building that pulpmill.

Senator GRUENING. Well, would you be authorized to say that your company would build the pulpmill if a supply of cheap power were made available?

Mr. DAVIDSON. I could not make that statement at this time, because we have so many other questions which have to be considered. But I will say this: that one of the extremely important ingredients

and one of the matters which we have to find out is the cost of power, not only mill costs but the original capital cost of providing the plants. We have, of course, exceeded our estimates in construction of the sawmill. The power facilities cost a half a million dollars for the sawmill itself. Now when we get into the quantity of power required for a pulpmill, this is something of far greater proportions. Now we cannot think of anything except that we have to provide power for it.

Senator GRUENING. I wanted to explore whether your situation was analogous to that of the Georgia-Pacific, or whether it was different. Now apparently your company has gone ahead and spent a substantial sum of money already in supplying power. Georgia-Pacific on the other hand says, "The Federal Government should do it, and then we'll come along and decide whether we'll play ball or not." Now would your situation be similar to that? Of course, I can't expect you to make a commitment, because we haven't even got that power project studied. But I'm interested to know whether there is a possibility of a more generous attitude toward this project, in which you say that if the Government can supply cheap power, you are reasonably certain to go ahead. This would be a much better situation than we find ourselves in with the Georgia-Pacific.

Mr. DAVIDSON. Let me put it this way, Senator. We would like to construct facilities which give us a reasonable expectation of making a profit on our investment. At this point we do not see our way clear to provide the investment for the pulp plant as well as the power facilities. We do not see that we can provide both of those facilities and come out with a reasonable expectation of making a profit. If we're talking about 1-cent power, it is one thing; if we're talking about 4-mill power, it would be feasible. If 3- or 4-mill power were available, then we would have, I think, a good possibility of putting in this mill.

Senator GRUENING. Have you any idea of how much installed power capacity you would like to have?

Mr. DAVIDSON. No, I haven't, I've forgotten the figures.

Mr. ROBERTS. I don't recall; it wasn't a very large amount as I remember.

Mr. DAVIDSON. It wasn't?

Senator GRUENING. Mr. Roberts, could you tell us whether there is any project in the neighborhood of Wrangell that has been under consideration?

FURTHER STATEMENT OF DARYL ROBERTS, BUREAU OF RECLAMATION

Mr. ROBERTS. Well, there are several in the neighborhood there: they are not real close. There is Taiya for one; I don't recall any others that we considered for study, although we never made a detailed study of it. We had one program at one time, but there seemed little or no interest for power, so we deferred going on with the study. You recall we had some correspondence, and I believe you advised me on some power needs, and I think that we still have the other forthcoming.

Senator GRUENING. Is Virginia Lake a possibility, do you know?

Mr. ROBERTS. It could be one down there; I don't recall. It has been so long since I've looked at that I can't give you a definite answer without referring to some of our studies.

Senator GRUENING. Well, I would like to suggest that the Wrangell needs and potentialities be explored as soon as possible.

Mr. ROBERTS. Wee would be glad to do that.

Senator GRUENING. I mean here we have a situation that is pretty definite; here is an outfit that wants to build a pulpmill. It would probably do so if it could get the power. It is not a huge project, not a project as large as some of the others and yet of vital importance to that community. So if we can transfer a few of those funds from the Speel River and some of the other sites up there, we might do it that way.

Mr. ROBERTS. Senator, we'll look at our program and see what we can do to cover the needs, not only of Ketchikan but of Wrangell as well.

Senator GRUENING. Fine. Are there any other comments from anyone?

Mr. C. V. Shay, city light superintendent of Petersburg, is here, and he has submitted a statement.

Mr. Shay, I understand that you have a sore throat and would prefer to have this statement read by someone else. I will be glad to read it; it is not very long. It is as follows:

STATEMENT OF C. V. SHAY, PETERSBURG, ALASKA

Senator GRUENING (for Mr. Shay):

The Council of the Town of Petersburg respectfully presents the following testimony relative to the status of the power needs of Petersburg and the surrounding area:

Petersburg entered the utility business January 15, 1925, upon completion of a hydro plant at Blind River, 18 miles south of town. The capacity of the original generator was 400 kilowatts. A second generator was installed in 1928. It was also 400 kilowatts, resulting in 800 kilowatts total plant capacity at 80 percent prime power. Industry followed with the installation of a cold-storage plant and a fish cannery. The Petersburg Cold Storage and Scow Bay Cannery became consumers in 1925.

In the early 1930's a 250-kilowatt diesel generator was installed in town, resulting in a total system capacity of 1,050 kilowatts. By 1945 the system load had increased sufficiently to require additional generation. At this time a 1,000-kilowatt diesel generator was installed in the town plant, resulting in a total system capacity of 2,050 kilowatts.

Additional load increases from 1947 until early 1954 indicated a necessity for additional low-cost power.

A feasibility survey conducted by R. W. Beck & Associates, of Seattle, in 1954 indicated 2,000 kilowatts in generation was possible by increasing facilities at Crystal Lake and Blind River.

To develop the maximum available output of Crystal Lake and transmit power to Petersburg the following projects were necessary:

1. Construction of a 25-foot rockfill dam.
2. Installation of a new steel penstock, 20 inches in diameter, four-fifths of a mile in length.
3. Construction of a new powerhouse.
4. Acquisition and installation of a three-phase 2,000-kilowatt transformer in a newly built substation.
5. Reconstruction of 18 miles of 24,000-volt transmission line to the outskirts of Petersburg.

The cost of this project was estimated at $910,000, and by redeeming $90,000 in outstanding revenue bonds a bond issue of $1 million was arranged.

Petersburg was incorporated on April 20, 1910. The population has steadily increased since that time: 1910, 585; 1920, 879; 1930, 1,252; 1940, 1,323; 1950, 1,605; 1960, 1,543. A survey by the Federal Power Commission shows 46 percent of the population are employed—in agriculture, 34 percent; manufacturing, 23 percent; wholesale trade, 14 percent; service industry, 13 percent; other employment, 16 percent; total, 100 percent.

Since the completion of the new hydroelectric project in 1956, the residential and commercial energy usage and the industrial loads have increased constantly. A system peak was reached during this past summer that exceeded the capacity of the generator in the new hydroelectric project installation. Load forecasting by the engineers did not anticipate such growth until in the early 1970's. By utilizing the additional 400-kilowatt output of one of the remaining old generators at Blind River for peaking purposes and by improving the distribution facilities in Petersburg, the town can gain additional generation and capacity that will permit an additional load to be placed on the system for a short period. Possibly with the average increase that has been experienced during the past 3 years, the present facilities will serve the needs of the area for another 5 years. When the full capacity of the hydroelectric facilities has been reached, it will be necessary to generate with diesel power.

Recognizing the high cost of generation by the use of fuel and the constant cost of maintenance and repairs on the equipment, it is very evident that a hardship will be placed upon both industry and other consumers who have experienced the relatively low energy costs which have been made available by the hydro. The council recognizes that additional power will not be available in the foreseeable future from development of Government projects and that feasible hydroelectric sources are not available within reach of this community. Therefore, the town of Petersburg desires to go on record with those communities which will, in the very near future, be greatly in need of low-cost power.

In recognizing the future development and progress that is sure to come to southeastern Alaska, the Council of the Town of Petersburg suggests that consideration be given to the future needs of the area (for future power development) and that your committee investigate the possibilities of development in the Thomas Bay area, located north of Petersburg and previously surveyed by the Department of Interior for possible hydroelectric projects. This area has a possible potential of three waterpower developments, consisting of Cascade Creek, Scenery Creek, and Delta Creek, all located in the Thomas Bay area, on the east shoreline. These three projects have a total proposed output of 42,000 kilowatts.

This completes Mr. Shay's prepared statement.

In view of the fact that you have a sore throat Mr. Shay, we won't attempt to ask any questions because I think that your statement is very complete. I would like to suggest to the Bureau of Reclamation that in studying the need of Wrangell, it include Petersburg. Those are practically twin communities, located only a few miles apart, and I suspect that one power project would be suitable for one and could be made to serve the other, with not too great a difficulty.

Mr. ROBERTS. Well, we would be glad to look into it Senator and see what we can work out.

Senator GRUENING. Are there any other persons desiring to be heard? If not, the record will be kept open for 4 weeks. We will be very happy to receive any supplementary statements. We would be very glad if Commissioner Dominy and Mr. Roberts would investigate the possibility of getting a switch on the funds from those projects which we mentioned earlier and which are not immediately pressing, such as the Speel River and see if we can't divert funds for the purpose of investigating the Ketchikan, Wrangell, and Petersburg needs which seem to be a little more pressing. We would be glad to collaborate if the Bureau would like a letter from the committee to that effect, I am sure that can be obtained.

Under the circumstances we shall stand adjourned. Thank you all very much.

(Whereupon the subcommittee adjourned, subject to the call of the Chair.)

(The following statement from the city of Wrangell was submitted for inclusion in the record:)

STATEMENT OF THE CITY OF WRANGELL ON POTENTIAL HYDROELECTRIC POWERSITES

AARON CREEK NEAR BLAKE CHANNEL

Location.—Aaron Creek, sometimes called Oern's Creek, discharges into a large delta on Blake Channel in latitude 56°23′ N., and longitude 131°59′ W., 23 miles by water from Wrangell. No lake has been found on the watershed. About 2 miles from tidewater, there is a narrow gorge, with a long flat valley above and a 4,000-foot rapids with 50-foot fall below.

Drainage area.—94 square miles tributary above the gorge, measured on International Boundary Commission's map, edition of 1927.

Runoff and regulation.—Estimated at 1,100 second-feet requiring 450,000 acre-feet of storage for complete regulation. Storage of 32,000 acre-feet should regulate the flow at 400 second-feet.

Damsite.—A proposed location for a dam in the gorge has a base width of 100 feet, a nearly vertical rock face of phyllite on the right side and a 3:1 slope on the other. Streambed and left bank is a heterogeneous fill of sand, gravel, and boulders of unknown depth. A 100-foot dam would have a crest length of 460 feet between existing ground lines. If this site is developed more than 20 feet high, an auxiliary dam will be required at a low pass 0.25 mile westerly; an 80-foot dam at this pass would have a crest length of 400 feet.

Application.—An application, No. 257, dated September 29, 1921, was filed with the Federal Power Commission, which issued a preliminary permit July 17, 1922. Applicant proposed to build a dam 100 feet high at the site described, creating a reservoir 4 miles long and flooding 1,600 acres. The upper 20 feet would provide 32,000 acre-feet of storage. Powerhouse would be 4,000 feet downstream from the dam, utilizing a maximum static head of 150 feet and average effective head of 118 feet, producing 9,798 horsepower at 70 percent efficiency. No mention was made of the required auxiliary dam. The permit was canceled August 16, 1923, applicant having failed to start the required stream gaging.

Development plan.—Exploration of the burden over bedrock at the damsite will be necessary before any development can be planned. A large seasonal power could be developed with a low diversion dam and forebay storage. Maximum economic height would probably not exceed 50 feet in any event, developing about 7,000 acre-feet of storage and regulating about 180 second-feet. For such a project, average static head would be 90 feet and effective head, 75 feet.

Power capacity.—Estimated at 1,200 primary and 7,500 average horsepower.

WHITE RIVER NEAR BRADFIELD CANAL

Location.—The mouth of the river is at the head of Bradfield Canal in latitude 56°13.9′ N., and longitude 131°30.1′ W., 40 miles by water from Wrangell. The river is comparatively short, with two main forks each 4 miles long, joining 1.8 miles from tidewater. There are no lakes on the system and cascades in the last 0.5 mile prevent salmon from ascending. A topographic survey of the area below the forks was made by Dort in 1921, and his report is followed closely in this bulletin.

Drainage area.—43 square miles, as shown on the International Boundary Commission map, edition of 1927.

Runoff and regulation.—No discharge measurements have been made. From the drainage area and unit runoff estimated for Anan Lake (12.3 second-feet per square mile) average discharge is estimated at 530 second-feet and nominal flow at 60 second-feet. Complete regulation would require available storage of 200,000 acre-feet, which is not practical. A 3,000-acre-foot forebay reservoir, regulating flow at 85 second-feet, is considered the economical limit.

Damsite.—This reservoir could be impounded by a 40-foot rockfill dam with crest at contour 350, just below the confluence of the main forks, 1.5 miles from

tidewater. Bedrock of gneiss is exposed on both sides of the river and the site suggests economy of a much higher structure but higher heads would probably result in large losses through slide material in an old channel to the eastward, which has been filled to an undetermined depth by loose rock from a slide.

Powerhouse and conduit.—Powerhouse can be located about 400 feet west of the mouth of the river. Conduit would be 6,800 feet long, with 5,200 feet of 102-inch wood-stave low-pressure pipe, 1,100 feet of tunnel and a 500-foot penstock.

Operating head.—Advantage can be taken of tidal draft averaging only 4 feet, due to mudflats in the canal. In winter months, average reservoir water surface would be at contour 337 and a nominal friction loss would leave an effective head of 340 feet. In summer, reservoir would be filled most of the time but friction loss would average 20 feet, leaving an effective head of 330 feet.

Application.—Permittee for FPC project No. 157, comprising development of Anan and Tyee Lakes, obtained preliminary permit for a White River project by an amendment to his permit dated June 26, 1922. Mr. G. H. Canfield, reporting officially, estimated average capacity of permittee's plan at 3,800 horsepower with very little primary power. A gagehouse was built but stream gaging was not started. By amendment, the permit was extended to March 13, 1925, when it expired.

Power capacity.—Estimated at 2,600 primary and 16,000 average horsepower.

TYEE LAKE NEAR BRADFIELD CANAL

Location.—The lake with an area of 445 acres at an elevation of 1,366 feet has its outlet in latitude 56°12.0′ N., and longitude 131°30.7′ W., whence Tyee Creek flows circuitously 2 miles to its mouth on Bradfield Canal, 40 miles by water from Wrangell. The region pertinent to power development was surveyed in 1921 by W. E. Dunkle, engineer for a permit applicant. Topography is rough and mountainous. Salmon do not run this creek.

Drainage area.—14.2 square miles, measured on the International Boundary Commission map, 1927 edition.

Runoff and regulation.—Record of the gaging station is summarized in appendix A8. For two complete climatic years, average flow was 178 second-feet. Incomplete records for 4 other years may be averaged with these, month by month, to compute an average of 182 second-feet, which is equivalent to 12.8 second-feet per square mile of watershed, the same as for Shelokum Lake. Complete regulation of this flow would require 72,000 acre-feet of available storage. This can be obtained by dam, drawdown tunnel or a combination.

Damsite.—As described by Dort,[1] there is an excellent damsite at the lake outlet, with cliffs of gneiss on each side and moderate talus burden. A concrete arch dam 50 feet high would have a crest chord of 240 feet; a 100-foot dam, a 320-foot chord. A dam 130 feet high or a tunnel drawdown of 190 feet would be required for complete regulation. A combination with a 60-foot dam and a 100-foot drawdown is judged economical, yielding an average static head of 1,380 feet above mean tide. With a loss of 20 feet in conduit, the average effective head would be 1,360 feet.

Powerhouse and conduit.—There is a satisfactory powerhouse site at tidewater on a small bight 0.3 mile east of the mouth of the creek. A 6,400-foot unlined tunnel on a 20-percent grade would tap the lake at the required depth. As an alternate, a 4,500-foot tunnel at the 1,250-foot level and a 2,000-foot penstock would have a lower initial cost. Dort also suggested[2] a powerhouse site "on the south shore of the canal about 3 miles west of Tyee Creek." Tunnel would be about 3,000 feet longer, but a raise could be driven to intercept flow of a small creek draining 5 square miles, thus increasing the capacity by about 6,000 horsepower. This area has not been surveyed.

Application.—FPC Application No. 157 was filed January 19, 1921, proposing a dam 100 feet high at the lake outlet and a 9,000-foot tunnel from the lake to the powerhouse as located above, power to be transmitted 18 miles to Anan Creek (q.v.) plant. Stream-gaging station was installed November 10, 1921, and preliminary permit issued March 13, 1922. Detailed surveys fixed the tunnel length at 7,308 feet, drifting 5,616 feet from contour 50 near the powerhouse to a 45° raise, 1,692 feet long to the 1,240-foot contour of the lake. By amendment, the permit was extended to March 13, 1925, but expired on that date.

Power capacity.—Estimated at 22,500 primary and average horsepower.

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[1] Loc. cit., p. 58.
[2] Loc. cit., p. 6.

HARDING RIVER NEAR BRADFIELD CANAL

Location.—This stream enters the north side of Bradfield Canal in latitude 56°12.8′ N., and longitude 131°38.2′ W., 42 miles by water from Wrangell. It is the outlet of Fall Lake 3.7 miles from tidewater (5 miles by river), with an area of 170 acres at an elevation of 182 feet. At 0.5 mile below the lake, the river runs through a narrow gorge with nearly perpendicular walls 100 feet apart between contour 120 and 280. Rapids continue 0.4 mile but the lower 4 miles of the river is mature, with a fall of 15 feet per mile. Above Fall Lake the valley is 0.2 mile wide with a very gentle slope.

Drainage area.—91 square miles, tributary to the damsite, according to the International Boundary Commission's map, edition of 1927.

Runoff and regulation.—Although a permittee established a recording gage on the river in November 1921 and maintained it intermittently for 4 years, stage discharge relation was not determined. Assuming unit runoff of 12.3 second-feet per square mile, as was estimated for Anan Lake (q.v.), average flow is taken at 1,100 second-feet, which would require over 400,000 acre-feet of storage for complete regulation. Economic storage is limited to 170,000 acre-feet, which would regulate 900 second-feet.

Surveys.—A topographic survey of the valley from tidewater to the head of Fall Lake was made by Dort [3] in 1921. Runyan and King, topographers of the U.S. Geological Survey, maped the watershed from tidewater to a point 2 miles above the head of the lake. Each survey extended across the muskeg pass to tidewater on Tom Creek.

Damsite.—As described by Dort, there is an excellent damsite at the head of the gorge, 0.5 mile below Fall Lake. Walls of the gorge are gneiss precipices with 1 : 2 slope between contours 120 and 280. Loose rock would have to be removed from stream bed to an estimated bedrock at contour 90. A dam 190 feet high would raise the lake level 98 feet, backing water 5 miles upstream from the head of the lake. Available storage between contours 205 to 280 is estimated at 170,000 acre-feet and mean reservoir level would be at contour 255. Draft below 205 feet would increase available storage but cost of conduit would be increased and average power would be less because of the lower average head and efficiency. Dam could be built higher but wing dams aggregating 2,100 feet long would be needed for a crest at contour 300. This might be justified for certain energy demands as it would increase storage to 240,000 acre-feet and primary flow to 1,000 second-feet. The main dam would have a 100-foot base and 280-foot crest. Either a rock fill or concrete arch dam would be adaptable to the site.

Powerhouse and conduit.—The mouth of Tom Creek, 2.5 miles west of the mouth of Harding River is the nearest tidewater and an excellent townsite. Conduit would be 16,500 feet long, including a 400-foot outlet tunnel around the west end of the dam, 15,300 feet of 132-inch wood-stave pipe and penstocks 800 feet long. Friction loss for primary flow is estimated at 23 feet of head.

Head.—With an average tidal draft to elevation −8, average head is estimated at 263 static and 240 effective for primary flow, and 268 static and 235 effective for average flow.

Application.—An application (No. 61) was made to the Federal Power Commission July 16, 1921, for permit on Harding River inter alia. A supplement to the application was filed December 2, but did not affect this part of the project. Preliminary permit issued May 6, 1922, for a period of 2 years. It was later extended to May 6, 1925, then expired. Permittee installed a stream gage, but no discharge measurements were made. His plan included the dam described herein and powerhouse about 2,000 feet below the dam, utilizing a maximum head of 175 feet to produce 9,000 to 10,000 horsepower.

Power capacity.—Estimated at 19,600 primary and 23,500 average horsepower.

The following is an engineer's report made in 1943 for the town of Wrangell and F. G. Hanford on the Mill Creek project:

Power capacity.—The primary capacity is 2,200 mechanical horsepower at 80-percent efficiency and 100-percent utilization with 26,000 acre-feet of storage. The average capacity is approximately 3,000 mechanical horsepower, limited by size of conduit. A 200-foot dam would develop sufficient storage for complete regulation, and with a uniform flow of 414 second-feet the maximum capacity of the site would be 5,800 mechanical horsepower at 75-percent efficiency and 100-percent utilization.

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[3] Loc. cit., p. 66.

	Estimated cost
Dam, rockfill	$175,000
Conduit, wood-stave pipe	80,000
Hydraulic equipment	70,000
Construction plant and quarters	50,000
Subtotal	375,000
Overhead, engineering expense, and contingencies, add 20 percent	75,000
Total	450,000

Pat Creek

Pat Creek has a drainage area of 6.3 square miles ranging in elevation from 90 to 2,500 feet. Based on the considerations outlined under "Hydrology," it is assumed that the mean annual precipitation over the watershed is equal to the Wrangell mean of 84.24 inches, plus 50 percent, or a total of 126.36 inches. This would result in a runoff of 58.4 cubic feet per second or 9.3 cubic feet per second per square mile, which checks well with the previously listed evidence. It should be noted, however, that this derivation of the flow—which forms the basis of the following power computations—is based on assumptions only. It would be necessary to install a stream gage and obtain flow records for at least 1 year before the available flow and power can be definitely determined.

The seasonal distribution of streamflow depends on temperatures, elevation, depth of snowpack, and ground storage. The low months are usually February, March, and April, and the ratio of minimum monthly flow to average annual flow is roughly one-tenth. With a mean annual flow of 58.4 cubic feet per second, the minimum thus would be on the order of 5.84 cubic feet per second. The heaviest runoff can be expected during July and August as a result of snowmelt. Since September, October, and November are the months of heaviest rainfall, the high-water period will extend from July through November.

Full utilization of the average annual flow would require greater storage than can be economically obtained. It appears from limited topographic information that the maximum storage is in the neighborhood of 700 acre-feet, which would be of little help during the long periods of low runoff.

Table No. 5 shows the kilowatts and the kilowatt-hours that could be generated during each month with the available flow and storage. It appears that a total of 1,358,000 kilowatt-hours could be generated during an average year and 1,169,000 during a dry year. During March, however, the capacity is only 33,000 kilowatt-hours of 46 kilowatts. The low-flow capacity of the project would thus be only 92 kilowatts based on a 50 percent load factor. The generating capability of Pat Creek will be further reduced during winter months by freezeup, and it is probable that there will be periods when only stored water is available for power generation. The above figures for kilowatt-hour capacity are based on a 70 percent maximum use factor. Daily load fluctuation prevents the full utilization of all available water and generating capability and a large amount of water would be spilled. The period of November to April, when the power requirements are greatest, happens to be the period of low flow and least capacity. The project capacity is greatest during the summer months when minimum demand exists. The power that could be generated is not sufficient to replace the present diesel plants and the hydroplant would only relieve the existing units. The principal benefit would be the saving of fuel to the extent of 1,358,000 kilowatt-hours, or approximately $18,300 per year.

Pat Lake has a normal water level elevation of 90 feet which could be raised to elevation 100 feet by a low dam. The overflow section would be 50 feet long and would have 25 feet long wing sections with concrete cutoff wall. The dam would have a sluice and the intake structure, gate, and trash rack would be adjacent to the concrete spillway. The penstock would consist of 1,200 feet of 20-inch steel pipe, coated and wrapped and buried.

The powerhouse would be located at tidewater and would house a single horizontal reaction turbine of 400 horsepower capacity. The turbine would drive a 3-phase, 2,400-volt, 300-kilowatt generator. The turbine and generator would be high speed units of 720 or 900 revolutions per minute. A bank of three single-phase transformers would step up the current to 12.5 or to 25 kilovolts and an 11-mile single-pole power line would transmit the power into town.

The following estimate is of a preliminary nature only, and contingent upon confirmation by further surveys and subsurface exploration:

Preliminary cost estimate

Concrete overflow dam	$51,000
Intake structure, gate, trash rack	6,000
Penstock, 1,200 feet, at 20-inch diameter, coated and wrapped	16,600
Powerhouse, excavation and structure	25,000
400 horsepower turbine, governor, and inlet valve	18,000
Remote control equipment	12,000
300-kilowatt generator, exciter, and accessories	14,000
Transformers and structures	9,000
2 circuit breakers, relays, insulators	4,500
Switchboard, meters, regulator, cable potential and current transformers, miscellaneous	6,000
11 miles of transmission line, at 7,500	82,500
½-mile access road	12,500
Subtotal	257,100
10 percent omissions and contingencies	25,710
Total construction cost	282,810
Engineering fee for design, 5½ percent	15,550
Administration, legal, supervision, inspection, and overhead, 6½ percent	18,380
Grand total	316,740

Interest and amortization costs on 20-year bonds at 4¾ percent interest would be $25,200 per year. The plant would be effective for only 5 to 6 months out of the year, and 100 percent diesel standby capacity would be required. The saving in fuel and possible saving in labor during this period would not be sufficient to justify the expenditure.

Anita and Kunk Lakes Basin

Anita Lake and Kink Lake are located on Etolin Island, 15 and 14 miles from the town of Wrangell. Anita Lake has an area of 180 acres at the 1,500-foot elevation and a drainage area of 2.3 square miles, extending to elevation 4,000. Kunk Lake, 1 mile north of Anita Lake, has an area of 250 acres at elevation 280 and a drainage area of 3.2 square miles to elevation 2,300. The lakes are parts of a potential multistage development with excellent hydropower possibilities.

The following possibilities exist:

(1) Anita Lake can be dammed off at its present outlet by a low dam or sill. The lake can be tapped by a tunnel about 75 feet below its present water level, which would produce a large storage volume without the expense of a high dam. The tunnel would be 1,600 feet long and of minimum practical size. Three thousand, one hundred feet of steel panstock would take the water to a powerhouse at the south end of Kunk Lake.

(2) Kunk Lake can be dammed off and the runoff conveyed through 3,000 feet of penstock to a powerhouse at sea level near the mouth of Kunk Creek. This project could be built independent of the Anita Lake development, using Kunk Lake water only, or as a sequence to the Anita Lake development and using the combined ruoff from Anita and Kunk Lake.

(3) Additional water could be diverted into Kunk Lake through a small diversion structure on the North Fork of Kunk Creek at the 320-foot level.

The Federal Power Commission in its reconnaissance report on "Water Power, Southeast Alaska," estimates the following mean runoff based on field observations:

Twenty-eight cubic feet per second at Anita Lake.
Thirty-eight cubic feet per second at Kunk Lake.
Twenty cubic feet per second at North Fork, Kunk Creek diversion.

This runoff amounts to approximately 12 cubic feet per second per square mile, which is in agreement with the figures previously quoted in the hydrology section and these figures are used in the following computations.

Table No. 6 shows the total runoff from the three water sheds—Anita Lake, Kunk Lake, and the North Fork—for a period of 24 years. The runoff for each year has been correlated from precipitation data using 86 cubic feet per second as the runoff during an average precipitation year.

ANITA LAKE

Anita Lake has the greatest power potential of the before-mentioned developments due to the high head that can be developed. The lake is rather inaccessible and frozen over almost 6 months of the year. Tunneling into the lake some 75 feet below the present surface of 1,500 feet would solve the icing problem in addition to obviating the need for a storage dam. This in turn makes an expensive access road unnecessary. The only work at Anita Lake would be the building of a sill at the lake outlet and possibly some work at the tunnel mouth and a cat trail would provide sufficient access to the site. Access to the powerplant at Kunk Lake offers no unusual difficulty and a high line could be built over the penstock line to the lower tunnel portal.

The pressure tunnel would tap Anita Lake at elevation 1,425 and the tunnel length would be 1,600 feet. Lake storage between elevation 1,430 and elevation 1,505, the top of the sill, would be approximately 10,000 acre-feet. The penstock would be 3,100 feet long, 26-inch average diameter, designed for 25 percent pressure rise and with relief valves to admit air in emergency conditions. The pipe would be welded or joined by Dresser type couplings and the sections would rest on saddles with concrete anchors at grade or line changes. With the powerhouse at elevation 315 and the average level of Anita Lake at elevation 1,465, there would be an average gross head of 1,150 feet. Firm power would be 2,010 kilowatts which would justify the installation of 4,000 kilowatt generating capacity. Maximum annual output would be 17,370,000 kilowatt-hours. The turbine would be a horizontal shaft impulse wheel of 5,500-horsepower capacity direct connected to the 4,000-kilowatt, 4,100-volt, 3-phase generator. A sending transformer would step the voltage up to 25,000 volts. There would be 2.5 miles of 25-kilovolt, 3-phase, single-pole transmission line to the mouth of Kunk Creek followed by 6,000 feet of submarine cable which would cross Zimovia Strait to Nemo Point on Wrangell Island. From Nemo Point the transmission line would run for 15 miles to the Town of Wrangell. It is proposed to operate the plant entirely by remote control by means of a carrier current circuit.

COMPARISON BETWEEN ANITA AND KUNK LAKES HYDROS

Following are comparative figures for the two developments:

	Kilowatt-hours installed	Annual capacity (kilowatt-hour)	Construction cost	Cost per kilowatt
Anita Lake	4,000	17,400,000	$1,550,000	$388
Kunk Lake	1,500	6,050,000	1,010,000	674

Required wholesale revenue in cents, per kilowatt-hour sold

	Annual production (kilowatt-hour)				
	2,000,000	4,000,000	6,000,000	10,000,000	15,000,000
Anita Lake	3.41	4.23	2.84	1.72	1.17
Kunk Lake	5.85	2.95	1.98		
Diesel expansion	3.30	2.80			

It is apparent that the advantages of the alternative projects depend on the power requirements.

The cost of power decreases as the load grows and the plant capacity is more fully utilized. The present annual requirements are approximately 2 million killowatt-hours and at the present rate of growth the requirements in 1965 would be 4 million killowatt-hours. Under these conditions the diesel plant would be most economical.

The hydroplants would be justifiable only if a large industrial development takes place, such as the proposed sawmill and plywood plant of the Pacific Northwest Timber Co., and a wholesale contract for a large block of power can be negotiated. If the anticipated annual load is between 4,500,000 and 6 million killowatt-hours, Kunk Lake would produce the cheapest power. At 10 million killowatt-hours, Anita Lake would prove to be most economical, and at a load of 15 million killowatt-hours the cost would decrease to 1.17 cents per killowatt-hour.

It follows that Kunk Lake is not desirable as the initial development since it is limited to 6 million killowatt-hour production and a comparable output could be produced by the expanded diesel plant at almost the same cost and with a much smaller initial investment.

Anita Lake would produce the cheapest power, provided that the load is sufficiently high, and this project would have the additional advantage that it could be expanded at a reasonable cost by a subsequent power development on Kunk Lake which would use the combined flow of Anita and Kunk Lakes. The Anita Lake and Kunk Lake developments combined would have a potential of 17,400,000 plus 10,600,000, or a total of 28 million killowatt-hours.

APPENDIXES

APPENDIX NO. 1

Technical Inter-Agency Power Group Report

[Press Release No. 679 of the Director of Civil and Defense Mobilization, July 15, 1959]

REPORT ON O.C. & D. TRANSMISSION LINE SURVEY IN ALASKA

Leo A. Hoegh, Director of Civil and Defense Mobilization, released today an advisory report of a recently completed survey of electric power facilities in the Anchorage-Fairbanks area of Alaska.

The report recommends the establishment of a power pool in that area so that military establishments and the general economy can have a reliable source of power. Such a supply, the report states, can produce an economy in Alaska which will insure both security and progress.

The power pool should consist of the systems of the military, the Bureau of Reclamation, the municipalities, and the electric associations, according to the report.

Mr. Hoegh said the report is now being reviewed within OCDM to determine the steps required to carry out recommendations that are approved.

The advisory report is based on a field survey undertaken in June 1959, by the Technical Inter-Agency Power Group. The group, organized in 1955, represents those Federal agencies which have a direct interest in an adequate power supply to meet defense production, military requirements, and other essential needs under full mobilization, and postattack conditions.

Members of the group are Arthur B. Vieregg, Interior Department, Chairman; George A. Grimm, Defense Department; Hugh M. Beshers, Business and Defense Services Administration, Department of Commerce; Edgar T. Hughes, Federal Power Commission; Selig Ginsburg, Office of Civil and Defense Mobilization; and George English, Interior Department.

(See statements following from Northwest Public Power Association and by Robert W. Retherford concerning interconnection of power facilities.)

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., June 29, 1959.

Hon. LEO A. HOEGH,
Director, Office of Civil and Defense Mobilization,
Executive Office of the President, Washington, D.C.

DEAR MR. HOEGH: The Technical Inter-Agency Power Group submits herewith its "Report of Reconnaissance Power Survey of the Greater Anchorage-Fairbanks Area of Alaska."

The report includes four recommendations, which the Technical Inter-Agency Power Group feels should be implemented at an early date, so that plans for the orderly development and construction of an economical power supply for this large and important area of Alaska will be achieved.

The Technical Inter-Agency Power Group experienced a refreshing eagerness among the people of Alaska to accomplish the objectives covered in the

report. Because of widespread interest in an adequate and lower cost power supply it is suggested that the report be made available to the Congress and general public at an early date.

Respectfully submitted.

SELIG GINSBURG,
Office of Civil and Defense Mobilization.
GEORGE A. GRIMM,
Office of the Secretary of Defense.
HUGH M. BESHERS,
Department of Commerce.
EDGAR T. HUGHES,
Federal Power Commission.
ARTHUR B. VIEREGG,
Chairman, Department of the Interior.

REPORT OF RECONNAISSANCE POWER SURVEY OF THE GREATER ANCHORAGE-FAIRBANKS AREA OF ALASKA

I. INTRODUCTION

In March 1955, at the request of the Office of Defense Mobilization, the Department of the Interior (Interior) organized the Technical Inter-Agency Power Group (TIAPG) with membership from the Department of Defense (Defense), Department of Commerce (Commerce), Federal Power Commission (FPC), and Office of Defense Mobilization (ODM), to study the adequacy of the electric power supply in the Niagara area under mobilization conditions. Similar studies of other areas were approved April 10, 1956, by the ODM and subsequently by the agencies represented.

All agencies represented on TIAPG have a direct interest in an adequate power supply to meet defense production, military requirements, and other essential uses under full mobilization, and postattack conditions.

For more than a year, technical discussions have been held with officials of the Department of Defense for the purpose of considering electric power problems in Alaska, with particular reference to the greater Anchorage-Fairbanks areas. On April 24, 1959, the Department of the Interior advised the Director, Office of Civil and Defense Mobilization (OCDM), of the Department of the Interior's request that the TIAPG consider undertaking a power study of Alaska. On May 1, 1959, Director Leo A. Hoegh of the OCDM, stated that he was in full accord as to the need and timeliness of the study proposed. A field reconnaissance survey was undertaken and is the basis of this report.

II. GENERAL

The TIAPG, during June 1959, made a field reconnaissance power survey of the Anchorage and Fairbanks areas in Alaska. Sectionally the Anchorage area includes Seward and Homer and the Fairbanks area includes Healy and Big Delta. This survey was made to ascertain the practicability of interconnecting the major electric power sources in the area with the ultimate objective of impressing upon the operators of the various systems the advantages of coordinating their operations through the formation of a power pool.

Upon arrival in Anchorage a conference was held with the commander in chief of the Alaska Command to acquaint him with the objectives of the survey. There followed meetings with officers of the Alaska Air Command and commanding officers of the military bases including Elmendorf AFB, Fort Richardson U.S. Army, Ladd AFB, Eielson AFB, Fort Greeley U.S. Army, the aircraft control and warning (A.C. & W.) site at Mount Olson and the ballistic missile early warning system (BMEWS) site under construction at Clear.

Meetings were held with the mayors, city councils, city managers, and officials of the municipal electric systems of Anchorage and Fairbanks; the president and technical faculty of the University of Alaska; the General Manager and officials of the Alaska Railroad; the manager of Chugach Electric Association, Inc.; the manager and members of the board of directors of the Golden Valley Electric Association, Inc.; the district manager of the Bureau of Reclamation, and the Alaska district engineer of the U.S. Army Engineers. Inspection trips were made to all major central station powerplants within the area including those located

at Homer, Seward, and the Chatanika hydroelectric plant, now under construction. Several small privately owned plants are located in the area but were not visited. Because of the sizable power requirements of the United States Smelting, Refining & Mining Co. and the company's interest in an adequate power supply for the area, the TIAPG visited one of the company's dredging activities.

The area between Anchorage and Fairbanks was observed from an Alaska Railroad train. The trip afforded a view of agricultural development and community activity along the railroad and gave some idea of transmission right-of-way problems which might be encountered when the Anchorage-Fairbanks interconnection is undertaken. Also, it presented an opportunity to view the general area of coal deposits near Healy and the potential hydro sites now under study but presently undeveloped on the Susitna and Nanana Rivers.

III. FINDINGS AND CONCLUSIONS

1. Alaska will continue to be an important sector of the defense frontier of the United States. Of necessity Alaska's economy will be largely tied to military expenditures. Therefore, future planning for the advancement of Alaska must recognize that defense of the United States rates the highest priority in any planning scheme and that only close cooperation between military and civilian forces can produce an economy which will insure both security and progress.

2. From a power supply standpoint, initially each electric system in the Anchorage-Fairbanks area whether military, municipal, cooperative, Federal, or industrial, has been designed to be self-sufficient with each system providing its own generating reserve capacity. Such planning is appropriate for early development of frontier regions. However, at the present time, the growth in loads has depleted the reserves of some of the systems and additional capacity is now needed.

3. Over the years the advancement of power supply planning in the other 48 States has resulted in the development of power pooling which has made possible quality electric service at the lowest cost.

Experience in power pooling gained in the 48 States should be applied to the existing systems in the Anchorage-Fairbanks area, with the ultimate result that a more reliable power supply to the military establishments and the general economy will be achieved, and appreciable savings accrue to the region's economy in terms of lower capital investment and operating expenses.

4. A commendable start has been made in the Anchorage-Homer-Seward area in interconnecting the power supply systems of the military bases, the U.S. Bureau of Reclamation, the city of Anchorage, and the Chugach Electric Association, Inc. Definite plans have been made and some construction is underway to interconnect the electric utility facilities of Homer Electric Association and the city of Seward with the Chugach Electric Association, Inc. Thus, when this plan is carried out the entire Anchorage-Homer-Seward triangle will be interconnected and may be operated as one system.

5. The generating capacity available in the Anchorage area is shown in the following tabulation:

[In kilowatts]

System	Installed generating capacity	Largest generating unit
Elmendorf Air Force Base	23,500	7,500
Fort Richardson	32,600	4,000
Knik Arm	15,400	5,000
Eklutna, U.S. Bureau of Reclamation	[1] 30,000	15,000
City of Anchorage	6,736	1,100
City of Seward	2,525	1,500
Homer Electric Association	2,350	600

[1] Hydro.

A 15,000-kilowatt hydroplant is under construction (Cooper Lake) by the Chugach Electric Association, Inc.

6. Some progress has been made in planning the interconnection of electric systems in the Fairbanks area. However, no system interconnections exist between any of the military bases, such as Ladd Air Force Base, Eielson Air Force Base, and Fort Greeley; nor are the electric systems on these bases intercon-

nected with the neighboring electric systems, such as the city of Fairbanks and Golden Valley Electric Association, Inc. An emergency connection between the electric system of the city of Fairbanks and the Golden Valley Electric Association, Inc., now exists and plans are underway to establish a firm interconnection.

7. The generating capacity available in the Fairbanks-Healy-Big Delta area is shown in the following tabulation:

[In kilowatts]

System	Installed generating capacity	Largest generating unit
Ladd Air Force Base	29,000	5,000
Eielson Air Force Base	15,000	5,000
Fort Greeley	3,000	1,000
Golden Valley Electric Association	9,500	3,000
City of Fairbanks	8,500	5,000
Clear (under construction)	22,500	7,500
Chatanika (under construction)	[1] 5,600	5,600

[1] Hydro.

8. Construction is underway at the BMEWS site at Clear including the installation of three 7,500-kilowatt steam-electric units. It was stated to the TIAPG during a visit to the site that no interconnection is contemplated between this plant and any other system in the area.

9. The combination of steam heat production and electric generation in a single plant is presently accepted practice in the Anchorage-Fairbanks area. Plants of this type are located at Elmendorf AFB, Fort Richardson, Ladd AFB, Eielson AFB, city of Fairbanks, and the Chugach Electric Association, Inc. Operations of this type are adaptable to power pooling and when so operated will improve the economy of the steam heating and electric production.

IV. RECOMMENDATIONS

1. Immediate steps be taken to organize a power pool in the Anchorage-Fairbanks area. Such a pool should include the systems of the military, Bureau of Reclamation, the municipalities, and the electric associations. The undertaking must be a cooperative venture, perhaps patterned after the Northwest Power Pool, the Connecticut Valley Power Exchange, or any other established pool.

2. A task group consisting of representatives of power suppliers, the military, and the University of Alaska should be immediately organized. This group should visit some of the existing power pool system operating centers. The purpose of such visits is to obtain firsthand knowledge of what is being accomplished by power pooling and how such operations can further strengthen the power supply for defense and the general economy of Alaska.

3. Planning should be started for a transmission line of 115 kilovolts or higher. The line when constructed will serve as (*a*) an interconnection for Anchorage-Fairbanks and Big Delta, (*b*) provide an outlet for Mine-mouth steam-electric plants which might be constructed near Healy, and hydroelectric developments on the Susitna and Nanana Rivers and their tributaries, (*c*) supply power to isolated electric systems located along the proposed transmission route, (*d*) supply construction power during the building of future projects, (*e*) provide sources of backup power for the BMEWS site at Clear, and (*f*) provide an outlet for the experimental atomic power being developed at Fort Greeley.

4. The development of hydroelectric and thermal power sources should be carried on simultaneously to supply the firm power needs of the area. Thermal plants provide the energy needed during low runoff periods and allow banking of energy in reservoirs, an important factor in pooling arrangement. When warranted, thermal units of 30,000 kilowatts and above should be considered, because of the relatively low capital investment for one unit as compared to a number of smaller units. Saving of manpower and fuel results in lower cost power production when larger units are installed. Similarly hydroelectric installations to be undertaken within the next few years should be those that can be constructed easily and provide increments of capacity that will fit the progressive load growth and the development of the power pool. In the hydroplants like the thermal plants, larger size units should be installed rather than a number of smaller units.

APPENDIX NO. 2

Statements Submitted for the Record

STATEMENTS BY THE AMERICAN PUBLIC POWER ASSOCIATION

No economic study of Alaska fails to cite abundant waterpower as one of Alaska's most valuable and least utilized resources. But awareness of the fact has not yet resulted in realization of the benefit.

Today little of Alaska's vast hydroelectric potential has been developed. Existing usable hydroelectric nameplate capacity available for central station power in Alaska amounts to only 59,320 kilowatts.

Sparseness of Alaskan hydroelectric development was emphasized by the Department of Interior in a report submitted to the Senate Select Committee on Water Resources on December 16, 1959. The Department noted that:

"The greatest stride in water resource development in Alaska in the last 40 years was the completion of the 30,000-kilowatt Eklutna plant by the Bureau of Reclamation in 1955. This single plant, small as it is, more than doubled the firm installed capacity of the State."

Alaska's waterpower potential is tremendous. Expert estimates indicate a possible development of at least 20 million kilowatts of installed capacity. This is approximately four-fifths of the total installed generating capacity of all the hydroelectric plants in the United States.

Rampart Canyon alone would have an installed capacity of 4,760,000 kilowatts—about 2½ times the present installed capacity of Grand Coulee.

Less than one-fourth of 1 percent of Alaska's hydropotential has been harnessed.

Alaska's population is growing rapidly. In 1950, Alaska had about 128,600 residents. Today the figure is approximately 224,000. Population is expected to increase at an annual total rate ranging between 6 to 8 percent versus 1.6 percent for the United States. It is estimated that Alaska may contain 750,000 people by 1975—depending upon development of industry and military activity.

Alaska will need more electric power if only to supply normal needs of a burgeoning population and to extend the benefits of electricity to more of its people through increased usage and wider distribution.

Today Alaska's economy is heavily dependent upon the Defense Establishment. Employment reflects a service industry pattern. Nondefense industry is based on development of natural resources.

Alaska needs industry. Development of the State's hydroelectric resources will provide the low-cost power which will help attract it.

An abundant supply of low-cost electric power stimulates economic expansion. Availability of electricity creates industrial growth. One recent example:

Earlier this year the Bonneville Power Administration announced availability of 300,000 kilowatts of firm and secondary power. Last month BPA reported tentative allocation of that power to provide for establishment of two new electroprocess industries and plant additions for two existing industries. Investment in new plant facilities alone is expected to approximate $140 million. It is reported that total inquiries received by BPA were close to or in excess of 1 million kilowatts.

In its report to the Senate Select Committee on Water Resources, the Department of Interior said of Alaska:

"It is generally believed that the development of a large block of low-cost power at this time would do more than any other program to encourage the needed industrial growth of the State. The most likely source of low-cost power is hydroelectric."

Ivan Bloch, private industrial and economic consultant, pointed out the significance of low-cost hydroelectric power for industrial development of Alaska. In a study entitled "Alaska: The Economic Outlook," he noted that:

"The importance of these large hydroelectric projects becomes clear if the power requirements of national electroprocess industries are examined. These industries, such as for the production of aluminum and other light metals, ferroalloys, and a host of important chemicals such as chlorine and caustic soda, are expanding more rapidly than other segments of national industry. By consequence, their power requirements for huge blocks of continuous and low-cost power are also increasing very rapidly.

"There are few locations in the United States where reliable power supplies of quantity and price suitable for these industries will be found during the next decade. The aluminum industry alone will be seeking some 2 million kilowatts of new power supplies well before the end of the next 10 years.

"Thus, by the time the major Alaskan projects are constructed and in operation, it appears quite clear that their output will be required by national electro-process industries, establishing major plants at deepwater location in southeastern Alaska, in the Prince William Sound and the Cook Inlet area."

The Department of Interior's report cites specific examples of possible Alaskan industrial developments which are contingent upon use of large blocks of low-cost power. Among them:

Construction of a plant by Harvey Aluminum Co. using a block of the 1,500,000-kilowatt potential of Wood Canyon project on the Copper River.

Establishment by the Georgia Pacific Alaska Co. of a newsprint mill operation using 30,000 kilowatts from the potential Snettisham project near Juneau.

Use of 80,000 kilowatts of low-cost power for processing iron-ore deposits at Klukwan near Haines and Port Snettisham near Juneau.

Creation of an ammonium nitrate plant to produce fertilizers to be located on the Kenai Peninsula and to require an estimated 10,000 to 20,000 kilowatts.

Alaska's massive hydroelectric power potential also has implications which transcend the State's boundaries.

As long as Alaska has hydroenergy surplus to her own needs there exists the possibility that low-cost energy might be shipped south over extra-high-voltage transmission lines to be tied in with a Pacific Northwest-Canada transmission network. Thus Alaska would serve as a giant storage battery upon which other power-short areas of the country might draw.

How can Alaska and the Nation realize the benefits of development of the State's waterpower resources for the production, transmission, and distribution of abundant low-cost power?

In a recent speech before the Alaska Rural Electric Cooperative Association meeting in Anchorage, Gus Norwood, executive secretary of the Northwest Public Power Association, spelled out seven public policies necessary to achieve this goal. They are: (1) mass production of low-cost power in large generating stations, (2) an integrated high-capacity grid system, (3) consumer owned electric distribution systems, (4) rural electrification under the area coverage principle, (5) low-cost investment of funds on a self-liquidating basis, (6) progressive electric-load forecasting, and (7) establishment of a statewide wholesale power marketing agency.

"These are the seven elements of Giant Power for Alaska," he said. "Their effective accomplishment might take 20 years. The time to start is now."

The job is a big one. State and local government, rural electrification associations, private firms cannot do it alone. Priority needs spread thin the funds available to Government. Geographic isolation of communities in Alaska makes difficult development of joint power supplies. Size, cost, and remoteness of prime projects discourages small investors.

Because of the strategic position of Alaska, the military installations which dominate its economy, the benefits which the United States will realize in increased economic strength through rapid development of Alaska, and the national responsibility for comprehensive development of river resources, the Federal Government has an unusually significant stake in utilization of Alaskan hydroelectric sites.

Ivan Bloch has pointed out in connection with his studies of Alaskan hydroelectric development that: "* * * it becomes apparent that these will entail extremely large sums of money. Both public and private funds will have to be utilized. In power development, to date, with one or two very minor exceptions, financing has been accomplished either through the issuance of municipal revenue bonds or through loans to local rural electric cooperative associations by the U.S. Rural Electrification Administration. The very large hydroelectric projects will require very long-term financing at lowest interest rates. Presumably these can be financed only by the Federal Government on traditional repayment basis. Private power development has made no progress in Alaska to this time."

Federal leadership will be required in planning for future bulk-power supplies for Alaska in order to assure that development is carried out in such a way as to provide all electric systems ample amounts of low-cost power for residential, commercial, industrial, and Government loads.

The Corps of Engineers has made a preliminary evaluation of some 169 possible sites in Alaska having a capacity ranging from a few thousand kilowatts to what can be the largest single generating plant on the North American Continent. An intensive study by the corps of the Rampart Canyon Dam site is now underway. The Bureau of Reclamation has been conducting studies of individual power projects in the State over the past decade.

Systematic and comprehensive development of Alaska's undeveloped hydroelectric sites should be authorized on the basis of these studies.

Creation of a regional power supply agency in Alaska could provide a means of fixing a utility responsibility to supply the net wholesale electric power needs of all distributors and consumers, helping to insure efficient development of authorized hydroelectric facilities, promoting maximum benefits through integration and coordination of regional power projects, and assisting in construction of backbone transmission lines to aid in dissemination of power to markets.

Today in the Soviet Union, the Russians are applying the lessons of new power technology. On the Angara River in Siberia, the U.S.S.R. is building Bratsk Dam. When completed it will have an installed capacity of 4.5 million kilowatts and will be the largest dam in the world in terms of power output. Twenty generator units of 225,000 kilowatts capacity—each the largest yet—will be employed.

Across the polar cap, Alaska contains similar vast hydroelectric resources. Only a minute percentage are now utilized. Yet the technical tools are available to make the State a vital source of energy, as the Russian example indicates.

As Senator Gruening told the Senate last year:

"What Russia is doing in Siberia presents a specific challenge to the United States to do no less in the area which was once Russian America—for 92 years the district, and then the territory of Alaska, and now the 49th State.

"In physical terms, Alaska is America's equivalent of Asia's Siberia. It lies in the same latitudes. It has corresponding climates. It has vast undeveloped natural resources. It has the greatest undeveloped power potential on the North American Continent."

Development of Alaska's hydroelectric potential would strengthen both Alaska and the Nation.

RESOLUTION OF ALASKA RURAL ELECTRIC COOPERATIVE ASSOCIATION, INC., ANCHORAGE, ALASKA

Whereas Alaska has a known hydroelectric power potential in excess of 18.5 million kilowatts; and

Whereas the availability of central station electric service at reasonable rates would contribute substantially to the economic and social development of Alaska, encourage the occupation and utilization of the land, and permit the use of laborsaving devices and better sanitary facilities on homesteads and in the villages; and

Whereas the future development of the abundant mineral, forest, and other resources of Alaska is dependent upon the availability of low-cost power; and

Whereas we in Alaska, as the 49th State and an integral part of the American community, are vitally concerned in the development of a comprehensive program for the effective utilization of America's power potential in the interest of social and economic progress, national defense, recreation, and the common good; and

Whereas it is our intent and purpose to support a comprehensive power program, not only for the benefit of our respective members, but for the benefit of Alaska and the Nation; now, therefore, be it

Resolved by the members of the Alaska Rural Electric Cooperative Association, Inc., in annual meeting assembled on this 5th day of August 1960, That the following principles and projects be adopted and supported in the interest of a comprehensive Alaska power program:

1. As a general statement of purpose we reaffirm the following objective: "To provide the best possible electric service for all users at the lowest possible cost consistent with sound business principles."

2. We endorse the principle of comprehensive development of Alaska's water resources through the construction of multipurpose dams and projects, following the recognized pattern of basin development as carried out in our Western States.

3. The principle of power pooling has been long recognized as the most expeditious method of improving area generating capabilities in the face of rapidly expanding electric loads. This association pledges its support and assistance in the formulation of power pool agreements, and strongly urges its member systems to actively promote and participate in the formulation of power pools to adequately provide for our expanding economy.

4. We commend the Alaska congressional delegation and the Corps of Engineers in connection with the proposal for the Rampart project. We urge the earliest feasible completion of the project report. We contemplate that power from the Rampart Dam development can be scheduled over a long period of years, and that it is a long-range solution to the power needs of much of westward Alaska.

5. Current estimates of power availability from the Rampart project suggest a 15-year interval before completion. During this period, other sources of power must be developed to meet Alaska's growing needs. In order that power may be programed in the most logical manner, we recommend that the Corps of Engineers expedite a complete report on the Bradley Lake project in order that this power will be available no later than 1965. We also urge the corps to study the feasibility of early development on the Nenana River. We favor authorization of the Snettisham project. We recommend that the Bureau of Reclamation expedite completion of the Susitna River Basin report in order that, in the face of our growing power requirements, the projects recommended may be scheduled for completion by 1968.

6. A report has been prepared by the U.S. technical interagency power group representing five Federal agencies investigating the feasibility of a transmission grid system for the rail belt which would intertie the principal cities in the rail belt area. As the consensus of the report was that such intertie would contribute very substantially to national defense and economic development of Alaska, we urge that the Secretary of Interior, in conjunction with such other Federal agencies as may be appropriate, initiate a detailed investigation, under the authority of the Flood Control Act of 1944, leading to a definite project report on a transmission grid system for the Anchorage-Glenallen-Fairbanks-Big Delta-Cordova-Valdez-Seward and Homer areas.

7. We urge the Corps of Engineers to prepare an early detailed study of the waterpower resources of Kodiak Island.

8. We urge the U.S. Geological Survey to increase its program of stream gaging in Alaska, including the Yukon River and tributaries, and on the streams of Kodiak Island.

9. We urge the Federal Government through the Atomic Energy Commission to broaden its activities in the development of public power through increased activity in the small reactor program. We recommend nuclear power for Alaska.

10. We pledge our assistance to any ARECA recognized organization in the preparation of an aggressive power program for Alaska to insure an abundant supply of power at the lowest possible cost to attract pulp mills, electrometal, and other basic industries to the State.

11. We resolve that the association shall continue to develop and support a common legislative program in the interest of all electric cooperatives in Alaska.

12. We favor the adoption of a Federal capital budget as provided in Senate bill 1244.

13. We oppose any efforts to increase the interest rates which would be paid by borrowers from the Rural Electrification Administration.

14. We express appreciation to the Federal Power Commission for their recently published Alaska power market survey.

15. Having taken cognizance of the fact that revenues of the Eklutna project are greater than was expected when the amortization schedule was adopted, and pursuant to the policy that electric energy from such projects shall be sold at the lowest rate consistent with such amortization schedule and operating expenses, we urge the Bureau of Reclamation to review immediately the rates at which electric energy is sold to the several utilities served by the Eklutna project with a view to reducing such rates to a level consistent with the amortization schedule and operating costs.

16. We favor policies which recognize that a highway right-of-way is a multiple-purpose right-of-way for public purposes including water, communications, electric and other utility purposes.

17. We express our appreciation to the State administration and Alaska State Legislature for the enactment of legislation relating to electric power and for the expression of confidence in electric cooperatives which such legislation implies. We particularly urge the Governor to implement the Public Service Commission Act and chapter 135, SLA 1960, relating to power development.

18. We urge the establishment of an Alaska power agency to provide leadership in the planning and promotion of an Alaska power program.

STATEMENT OF KENAI PENINSULA PUBLIC UTILITY DISTRICT NO. 1

HOMER, ALASKA, *August 31, 1960.*

Hon. JAMES E. MURRAY,
Chairman, Senate Committee on Interior and Insular Affairs, Washington, D.C.

DEAR SENATOR MURRAY: We have been advised by Senator Gruening of the Senate hearings to be held at Anchorage concerning power requirements and resources in the State of Alaska, on September 7, 8, and 9, 1960.

Because of time limitations and the fact that we are now engaged in collection of the 1960 taxes and are making the 1961 assessment it will not be possible for us to send a representative to the hearings from this organization. However, Mr. Larry Farnen, manager of the Homer Electric Association expects to attend the hearings and will be presenting the information from this area concerning power requirements.

Request is made for inclusion of the following information pertaining to resources directly related to the development of additional sources of electrical energy.

Homer, Alaska, is located on the Kenai Peninsula southwest of Anchorage, Alaska, approximately 226 miles by road, or 1 hour's flying time by scheduled aircraft.

According to the recent U.S. census the population within this public utility district covering 54 square miles is 1,239 persons. The adjacent trading area represents an additional 1,500 persons living on the shores of Kachemak Bay, Cook Inlet, and along the plateau just north and east of the boundaries of our district. The 1940 census showed a population of 325 persons and the 1950 census indicated 725 persons in this area. The rate of increase for the 20-year period computes to 13.9-percent average per year. Actual observations show that the greatest increases in population occurred at two distinct periods and for good reasons. The increases in population during the period 1940–50 occurred during the years immediately following World War II when certain provisions of the Homestead Act allowed veterans to obtain patents with minimal requirements. The period 1946–48 was a time of growth in clearing land under certain agricultural laws that provided payments to veterans for farm training, etc.

The period 1950–60 was also a period of growth, though many of the patents issued resulted in dormant land with the veterans moving to other areas, because it was found there were only limited markets for produce and other crops, and surface transportation out of Homer was not available. Construction of the Sterling Highway was started in 1935 and the highway was completed to a gravel surface condition in 1951. In the years subsequent to 1951 the growth of this area has been steady. Prior to 1951 electrical requirements were met on an individual basis with a majority of the local residents depending upon gas and kerosene lanterns for lighting. The first diesel generation electrical plant was placed in operation in 1951 through establishment of a rural electric cooperative, the Homer Electric Association. The advent of electrical power in the community resulted in attracting many more people to settle on homesteads, numerous additional service businesses were established and the general welfare of the community was elevated. In 1951 there were 74 business licenses issued in Homer by the territory of Alaska. The 1959 report shows 113 business licenses issued. Correspondingly, the business volume of the community has almost tripled during the period 1952 through June 1959. Gross receipts were $695,920 in 1952 and in June 1959 the report of the department of revenue indicates gross revenues of $2,015,612.

The extent of the resources in the Homer area is not fully known because of the limited surveys and examinations of minerals and other natural resources. Various branches of the Federal and State Governments have made preliminary tests and samplings of coal ores, limestone deposits, etc.

To cite a few examples:

1. Development of farming in Alaska continues to grow in the Matanuska Valley, Tanana Valley, and on the Kenai Peninsula from the standpoint of the dollar value of crops produced. Much of the land requires commercial fertilizers to supply the necessary nutrients for good production, where organic fertilizers are not available. Possibilities of a nitrate plant for production of fertilizer has been given consideration, in view of the ready access to materials and potential low-cost power from the site of Bradley Lake. The U.S. Geological Survey Bulletin No. 587, titled "Geology and Mineral Resources of Kenai Peninsula, Alaska," indicates limestone deposits are located along the southerly shore of Kachemak Bay, adjacent to the city of Seldovia. Such deposits may prove to be valuable as blast-furnace flux or for agricultural usage. Accessibility of this locality is considered the most advantageous in this part of Alaska.

2. The chromite ore of Red Mountain and Claim Point have very appropriately been described as the largest known deposits of this type of ore under the American flag. U.S. Geological Survey Bulletin No. 931–G describes these deposits. The estimate is given that there are some 200,000 tons of chromite ore, nearly all of which will require concentration for shipping.

3. The community of Homer has a major problem to overcome, that of drainage of surface water and disposal of sewage. The underlying problem is the fact that there is little vertical drainage in the area, due to the impervious layer of clay a short distance below the surface of the land. Determination can be made that the clay deposits cover a large area in view of the numerous wells that have been drilled for water over a sizable area and the seismological explorations by several oil exploration firms. Several individuals have made tests and found that the local clay has good qualities for ceramic work. Complete analysis is needed to determine potential uses of the clay. Manufacture of bricks for construction may be a good possibility.

4. St. Augustine Island is approximately 80 miles west of Homer and is near the west shore of Cook Inlet. Large deposits of pumice have been found there, though very little has been done to utilize these deposits for manufacture of pumice block. At last report, which is several years old, the problems of transportation, loading and unloading facilities had not been resolved. Other uses for pumice have long been known, such as polishing compounds.

5. Coal resources in the Homer area have been examined in somewhat more detail than any other mineral in the area. Homer Bulletin 1058–F, titled "Geology and Coal Resources of the Homer District Kenai Coal Field, Alaska," describes the chemical analysis of the beds found in the area. The analysis shows that the coalbeds in this region are about equivalent to the Nenana field beds as to production of steam and heating. Several potential uses exist other than use for heating. Low-temperature carbonization of this type of coal for a char, gas, and byproduct chemical is a possibility. Also it is considered that a technically possible use would be the hydrogenation or conversion of coal to a synthetic liquid fuel. One major disadvantage is the fact that the Homer coals are just not suitable for coking purposes. Coking is of course of major importance to Japan, since they import about 3 million tons a year from the United States.

Returning to Alaska's greatest resource, the people of Alaska, we believe that the Kenai Peninsula enjoys a favored position in Alaska from the point of climate and scenic beauty. Travel to Homer by residents from all parts of the State of Alaska is open to choice of air travel, surface travel, and water. More and more Alaskans are finding that the temperate climate found in this area is a welcome change from the severe winters of the far north and extremely warm climates that occur in the summer season. Because of the location and natural mountain barriers of the Kenai Mountains, the high-wind trajectories carry the heavy rains away from Homer and give our area an average rainfall of only 25.06 inches per year. This is somewhat remarkable considering that a majority of the coastal communities from Ketchikan to Kodiak experience average rainfalls ranging from 50 to 150 inches per year.

Many Alaskan residents are learning of this favored location and are planning to retire in the Homer area. Better than 50 percent of the land within the public utility district district is owned by persons who do not reside in Homer.

The tourist industry offers a very fine potential for the Homer area, once the Sterling Highway is completely surfaced. As more and more tourists discover that Alaska is within their financial means and that jet travel has reduced the travel time to a matter of a few hours, the demands for increased facilities will greatly increase.

King crab from the icy waters of Kachemak Bay are becoming widely known in Alaska and the Western States. This new industry is expected to provide year around payrolls for fishermen and cannery workers. Presently, there are two small canneries operating at Homer. Construction of the federally sponsored small-boat harbor at Homer will provide one of the major tools to develop a steady fishing industry in this locale.

The deepwater port at Homer holds great promise for the western side of the Kenai Peninsula as the communities of Homer, Anchor Point, Ninilchik, Clam Gulch, Cohoe, Kasilof, Kenai, and Soldatna develop. Now, this small port facility represents 33⅓ percent of the westward Alaska port facilities connected to the central Alaska highway system.

The full significance of the oil industry activities north of Homer in the Soldatna area has not been mentioned previously since we are not aware of the plans of the major and independent oil companies for this area. We note that a dock is being constructed at the northwesterly tip of the Kenai Peninsula and that it is planned to lay a pipeline from the oilfield so that the crude oil can be loaded on vessels for processing at another location. As the perimeter of the drilling activities is widened from the original Swanson River unit, the Homer area will undoubtedly benefit from the increased activities. Construction of a refining plant on the Kenai Peninsula is of course possible, should the demands for petroleum products reach sufficient volume to warrant such construction. However, this is considered doubtful unless much larger markets are found than the current projections.

Production of lumber from the forests on the Kenai Peninsula has long been an active vocation from the earliest history of Alaska. In recent years there have been as many as 35 separate lumber mills operating between Seldovia and Seward. The majority of these mills have not been large producers, due to limited capital, small markets and insufficient experience of the operators. As the growth in population continues the demands for lumber for home construction will surpass the mill outputs. Currently, the lumber mills on the Kenai Peninsula do not have surpluses of dimension lumber. A number of the mills have found it is more economical to use electricity for their operations rather than use diesel powerplants, even considering the presently high electrical power costs.

Referring to our earlier statements on population of the Homer area, it is quite apparent that this section of Alaska is growing at a rate of 13.5 percent each year. The tax valuation of this district has increased from $1,034,324 in 1951 to $6,953,170 in 1960.

Technically, we are not equipped to project power requirements for the growth of the area, since we are not engaged in the generation, transmission, and distribution of electrical power. The local Homer Electric Association is being furnished copies of this report which we trust will be of some assistance to their projections of electrical power requirements for this area.

We feel there is a definite need for development of additional electrical power generation for two reasons: (1) Present power rates are very high and do preclude any large quantities of power being used by industrial firms; this, of course, retards development of our resources; and (2) the present supply of firm power will soon be insufficient to meet the needs of the area. Availability of cheap hydroelectric power at the earliest possible date will prove to be one of the main tools for development of the Kenai Peninsula.

The foregoing information has been compiled by the Trade and Economic Committee of the Homer Chamber of Commerce and the writer. Should any additional information be desired that may be available from our sources we shall be pleased to assist in every way possible.

Sincerely yours,

HOMER S. THOMPSON, *Manager.*

STATEMENT OF CITY OF SEWARD

SEWARD, ALASKA, *September 6, 1960.*

SENATOR GRUENING AND GENTLEMEN: The citizens of the city of Seward, like many people in Alaska, are confronted with exceedingly high rates for electric power. These rates will not encourage industry or business to settle in Seward and are a distinct burden on all power users.

These rates are necessary under existing conditions to carry our heavy bond burden and to furnish the necessary operation and maintenance. It has gotten to the point that something must be done to obtain power at a lower cost.

It is realized that the primary purpose of these hearings has to do with the overall power picture and the furnishing of great quantities of power at very low cost. This, of necessity, would take years for study and construction prior to availability of such power.

There is a distinct need now which will be aggravated to some extent within the next 4 or 5 years. It is hoped that this immediate need will not be lost sight of in planning to take care of the future needs of the State.

Very truly yours,

Rear Adm. CHESTER A. KUNZ,
U.S. Navy (Retired), City Manager.

STATEMENT OF THE CITY OF SKAGWAY, ALASKA

THE HYDROELECTRIC POTENTIAL OF THE SKAGWAY, ALASKA, AREA

A vast horsepower potential is evident by dropping a portion of the headwaters of the Yukon River in Canada down to the Alaska side under Chilkoot Pass into the Taiya Valley near Skagway.

The cost per horsepower is probably the lowest anywhere in the North American Continent.

Said horsepower is estimated at minimum of 880,000 to 4,800,000. One should contact proper authorities in Ottawa, Victoria, Washington, and private industry at Pittsburgh to properly estimate today's correct figures.

Procedure would be to build higher dam at Whitehorse, Yukon, Canada, where headwaters are funneled through a narrow neck called Miles Canyon, and thereby back up waters to possibly 30 feet higher level. This would not only permit normal flow of water down the Yukon but allow for diversion to the Alaska side as well.

In 1952 private U.S. industry wanted to obtain permit to spend $400 million on the first phase of this project for the purpose of reducing bauxite to aluminum, but was unable to obtain the necessary permission from the Canadian Government, and others involved. In 1957 this private industry withdrew their interest.

Today, it would appear probable and feasible to construct such a plant, but it may be up to Canada and United States to jointly develop the hydro possibilities for sale of electricity to private industry or utility.

Location: Skagway is located about 80 air miles north of Juneau, the capital of Alaska, and about 100 air miles south of Whitehorse, the capital of Yukon Territory of Canada. It is an all-year-around, ice-free port which serves as a transfer point for Canadian freight between Yukon, northwestern British Columbia, and the Greater Vancouver area.

Transportation: Daily airline service; regular scheduled freighter service all year around and four passenger vessels plying between Vancouver, Canada, and Skagway during summer months; the 110-mile narrow-gage White Pass & Yukon Route Railway to Whitehorse, which operates all year around. It would appear possible to have highway constructed to Carcross, Yukon, and distance of seventy-some-odd miles before too long, which would be economically justifiable in several directions. Too, the proposed all-year-around Prince Rupert-Haines-Skagway ferry system would service the area. Smaller ferry now operates summers.

It should be stated that the history of Klondike gold rush days plus the unusual beauty of the area attracts thousands of tourists every year which would be considerably increased with industrial expansion and transportation improvement.

You are respectfully referred to the following U.S. Geological Survey reports: Circular 252, "Potential Alaskan Mineral Resources for Proposed Electrochemical and Electrometallurgical Industries in the Upper Lynn Canal Area, Alaska," by W. S. Twenhofel, and circular No. 280, "Potential Industrial Sites in the Lynn Canal Area, Alaska," by Arthur Johnson and W. S. Twenhofel.

In addition to bringing up to date the recommendations in the above two circulars, the following is suggested for consideration:

1. Canada and United States to construct hydroelectric plants.
2. U.S. Government (or both Governments) to develop public plants for electrical utilization.
3. Encourage private industry to locate in the area, preferably those which would use huge amounts of electricity.

4. Power would be created for adjacent areas, and possibly be an important part of a power pool in Northwestern America (Canada and United States).
5. Defense plants could be constructed.
6. Examination of Yukon and other Canadian areas for materials to reduce at tidewater.
7. Investigation of prospects of group headed by Robert Crowe-Swords, Sr., 510 Credit Foncier Building, Vancouver 1, Canada, which has option on certain beach lands at Skagway for purpose of constructing two smelters.
8. Impact of additional tourists in the general area.

A trip to Skagway might prove most beneficial to all interested parties.

The courtesy to present this brief is most gracious and deeply appreciated.

CYRIL A. COYNE,
President, Skagway Chamber of Commerce.

SEPTEMBER 10, 1960.

STATEMENT OF GUS NORWOOD, EXECUTIVE SECRETARY, NORTHWEST PUBLIC POWER ASSOCIATION

ALASKA HYDROELECTRIC DEVELOPMENT

My name is Gus Norwood. I serve as executive secretary of the Northwest Public Power Association which comprises 113 consumer-owned electric distribution systems serving over 2 million people in Montana, Idaho, Oregon, Washington, Alaska, and British Columbia.

Our member electric systems in Alaska are as follows: Kodiak Electric Association, Golden Valley Electric Association, Homer Electric Association, Chugach Electric Association and Matanuska Electric Association, the cities of Nome, Cordova, Petersburg, Fairbanks, and Ketchikan, and the Dillingham PUD.

In August 1960, I completed my eighth tour of our Alaska member systems. My first visit was in 1952. These trips, coupled with our Alaska library and files of correspondence covering the past 13 years, have given me considerable familiarity and concern with Alaska hydroelectric development needs.

Each year I have also made a number of talks in Alaska urging power investigations, power pooling and legislative action.

Eklutna project

Specifically, we testified on February 3, 1950, for H.R. 940 which became the Eklutna Project Act of July 31, 1950 (64 Stat. 382).

On November 3, 1952, after my first trip to Alaska, I wrote Senator Cordon in justification of the expansion of the Eklutna project.

On March 3, 1953, we testified for S. 2097 and H.R. 1374 to amend the Eklutna Project Act to expand the project and increase the appropriations ceiling. This became Public Law 260, 83d Congress, approved August 13, 1953.

On May 11, 1960, we testified against S. 3222 to reallocate the power output of the Eklutna project and instead we urged further study by the Bureau of Reclamation. We continue to urge further restudy of Eklutna.

On August 13, 1959, we wrote Commissioner Floyd Dominy urging a review of Eklutna power rates which appear to be about $100,000 per year in excess of legislative requirements. We continue to urge such a rate review.

Alaska water resources investigations by the Bureau of Reclamation

Under the Interior Department Appropriations Act of 1949 a sum of $150,000 was made available to start the Bureau of Reclamation's water resources investigations in Alaska.

The first result was the Eklutna project report of October 1, 1948.

The second result was the famous reconnaissance report of May 2, 1949, published January 1952 as House Document 197, 82d Congress, 1st session, which tabulated a power potential of 8,294,000-kilowatt capacity in Alaska.

On June 14, 1955, we testified in favor of H.R. 3990 to establish a firm legislative basis for Interior Department water resources studies in Alaska. However, we opposed the $250,000 per year limitation therein. The bill, containing the limitation, became Public Law 322, 84th Congress, 1st session, approved August 9, 1955.

In 1959, we testified in favor of S. 1514 to remove the limitation but this bill failed in the House. We urge removal of the $250,000 ceiling by the next Congress.

Three categories of hydro projects

Some Alaska power projects are more dramatic than others. Certainly Rampart Dam on the Yukon may at once captivate the imagination and also scare the Congress. Other less dramatic projects are capable of meeting the early need for more power.

Thus a balanced approach is needed to insure placing each project in proper perspective.

As a framework for such balance I would suggest classification of projects into three groups: short term, intermediate term and long term. Specifically Bradley Lake, Snettisham, and Swan Lake are short term, the Susitna River Basin project is intermediate term and Rampart Dam is long term. All these and studies for other projects should be advanced as part of a systematic, balanced hydro program.

Project reports are needed

It is assumed that Congress will not authorize a project unless a project report is completed. This normally requires 2 to 4 years. In the Susitna Basin work has been going on for some 10 years.

While we urge continued investigations and preparation of project reports, we assume that Congress, in 1961, can and will consider only the presently completed project reports; namely, Susitna, Snettisham, Bradley Lake, and Swan Lake.

Short-range program

Assuming that adequate marketing arrangements can be effected, we urge Congress to authorize the Snettisham project for the Juneau area.

If Ketchikan is similarly willing to make commitments on behalf of Swan Lake project, we urge its authorization.

Bradley Lake is ready to go and should be authorized for early construction.

In the alternative these projects could be authorized but with actual start of construction contingent on and scheduling dependent on marketing arrangements.

Long-range program

Obviously Rampart Dam is the long-range promise of large-scale low-cost power for the rail-belt area. Studies should be pushed along looking toward a project report within 2 years and followed by early authorization. Construction should then be staged in phases so that the power output can be absorbed to maximum advantage.

However, Rampart is a huge project and involves great cost and a long construction schedule. It would appear logical that it should be preceded in the rail-belt area by the short-term Bradley Lake and then the intermediate-term Susitna program.

Intermediate-range program

The Bureau of Reclamation has completed the Susitna River Basin project report for the 580,000-kilowatt Devil Canyon Dam, plus a 230,000-volt transmission line 160 miles southward into Anchorage and a 190-mile line northward into Fairbanks, plus later construction of the upstream storage Denali Dam to regulate the river for the benefit of Devil Canyon Dam, and ultimately for two other run-of-the-river projects.

The rail-belt 230,000-volt grid system will be the power axis which, in turn, can feed into Seward, Homer, Valdez, Cordova, Big Delta and intermediate communities.

Ultimately, Rampart Dam will feed into an expanded rail-belt power pool spreading over central Alaska.

Longer repayment period needed

The traditional 50-year repayment period has recently been modified to 60- and 75-year periods in the case of irrigation projects.

A similar approach is strongly urged for certain Alaska power projects such as Swan Lake where a development period of perhaps 5 years is needed to load the project.

It is appreciated that interest is the main cost in the early years of a project repayment period. Flexibility should be provided to tailor the repayment curve to the anticipated revenue curce and provide a safety cushion by means of a longer, optional repayment period of 60 or even 75 years.

Where a project is isolated, as is the Swan Lake, we would favor the Eklutna Project Act provision permitting transfer of the project to local ownership upon completion of payout. We think this will tend to create more of a proprietary interest and a sense of direct responsibility for the project on the part of the community concerned; for example, Ketchikan in the case of Swan Lake. In these cases, we also feel that the local community should be permitted an advisory voice in project planning, scheduling, and operating. All these points are already common practice of the Bureau of Reclamation in the case of local irrigation projects.

An Alaska power revenue pool

As the rail-belt grid system comes into being, it may be appropriate for an Alaska power account to be established for pooling power revenues to achieve a modified postage stamp rate from Federal projects. Some such arrangement might facilitate power development in smaller villages. The British Columbia Power Commission has developed such a pattern.

The biggest consumer

The Federal Government probably pays, directly or indirectly, for about half the electric power used in Alaska.

Any reduction effected in power cost will have a direct impact on the U.S. Treasury. The military people have been notoriously negligent on this point. They have always preferred high-cost steamplants instead of low-cost hydro.

Integration or coordination of all Federal, civilian, and military generating capacity can also save money. The rail-belt grid system will achieve the greatest amount of savings to the Federal Government.

The military posture

The writings of Admiral Mahan and others emphasize that the ultimate foundation of military strength lies in a strong peacetime economy.

A strong electric power system in Alaska is a military essential. It will give us more for our defense dollar.

Scandinavian pattern

Many lessons from the experience of Canada, the U.S.S.R., and the Scandinavian countries appear relevant to Alaska.

Low-cost electricity used in abundance can do much to mitigate the drudgery and hardship of north country living. It can improve the standard of living. It can increase productivity. It can stimulate the more rapid and systematic opening of America's last great frontier on a basis which will best serve the national interest.

Conclusion

The year 1961 should be a fundamental turning point for Alaska by action of Congress in authorizing the Susitna, Bradley Lake, and other projects.

This turning point can be as decisive as the 1933 start of Grand Coulee and Bonneville was for the Pacific Northwest.

Abundant, low-cost electricity is a basic tool for economic development.

NORTHWEST PUBLIC POWER ASSOCIATION, INC.,
Vancouver, Wash., November 8, 1960.

Hon. ERNEST GRUENING,
Senate Office Building, Washington, D.C.

DEAR SENATOR GRUENING: This letter is submitted as a supplemental statement to correct and modify the testimony we submitted on very short notice for the Alaska power hearings.

I also wish to outline a specific proposal for construction of a 230,000-volt transmission line of some 325 miles between Fairbanks and Anchorage as an immediately feasible and desirable project. (See statement of Robert W. Retherford, of Retherford Associates, Anchorage, Alaska, following statements of Northwest Public Power Association.)

In support of this transmission line, I submit the resolution adopted at Salt Lake City, Utah, on November 4, 1960, by the rural electric system delegates of Alaska, Oregon, Washington, Idaho, Montana, Nevada, California and Utah at the region 9 meeting of the National Rural Electric Cooperative Associa-

tion, which reads: "We endorse and urge Congress to direct the authorization for immediate construction of a rail-belt transmission grid system for Alaska, including provisions for power pooling in the Anchorage and Fairbanks areas by interconnecting Federal and non-Federal powerplants and loads."

Now a word of explanation as to our previous testimony. You will recall we testified in favor of a three-phase program of short-range projects such as Bradley Lake, intermediate range program based on the Susitna Basin and a long-range program comprising Rampart Dam.

This three-phase plan was premised on what appeared to be reliable comparative estimates of power costs of 5 mills for Rampart energy and 7 to 8 mills for Susitna energy. It had been our view that the cost differential was overbalanced by the fact that the Susitna report is about ready to go to Congress while Rampart requires 3 or 4 years of investigation. Also, we felt the scale of Rampart was so large as to make favorable action by Congress on Susitna more likely.

We were in error. The ultimate cost of Rampart Dam's 4,700,000 kilowatts is on the order of 2 mills per kilowatt-hour, not 5 mills. Also, Susitna power will initially cost more than 8 mills. Obviously, only Rampart holds any real promise of providing attractive industrial power, as you repeatedly pointed out.

We favor the earliest feasible construction of Rampart Dam.

Other factors which disturb the comparability is the fact that the Susitna River Basin project assumes the construction of both the downstream Devils Canyon Dam and the upstream Denali Dam followed later by two more downstream dams. The package would come close to $1 billion.

Rampart Dam, on the other hand, would provide its own storage sufficient for complete regulation of the Yukon River, and would do the whole job at one damsite.

As someone said, Rampart Dam is one girl worth waiting for.

Also, I am advised that Rampart can be constructed in stages and over a period of years such that the commencement of power production would occur relatively early in the total investment program.

But one part of the Susitna River Basin project report, the transmission line portion, is susceptible of immediate application and is fully usable even if no dam is built. The cost is small. Results can be achieved quickly. Risk is small. Also it fits into any of the short-range power proposals, such as gas turbine power production in the natural gas field on the Kenai Peninsula.

The Bureau of Reclamation has included in its Susitna study the construction of three 230,000-volt transmission lines from the Devil Canyon Dam, one north to Fairbanks and two south to Anchorage.

We respectfully urge the adoption of these plans, with modification, for earliest possible construction of one 230,000-volt line 325 miles long from Anchorage to Fairbanks generally along the Alaska Railroad.

This would open up a lot of country, reach many communities, tie into many isolated military installations, open mining areas and achieve all the gains of a power pool.

The enclosed memorandum and draft of an amendment of the Eklutna Project Act are submitted in support of this proposed program.

May we express our deep appreciation for your keen interest and many courtesies.

Sincerely,

GUS NORWOOD, *Executive Secretary.*

NORTHWEST PUBLIC POWER ASSOCIATION,
Vancouver, Wash., November 8, 1960.

RÉSUMÉ OF MEETING NOTES ON THE PROPOSED 230,000-VOLT ANCHORAGE-FAIRBANKS TRANSMISSION LINE

During the region 9 meeting of the National Rural Electric Cooperative Association at Salt Lake City, Utah, November 3–4, 1960, several meetings were held to discuss the feasibility of early construction of the 325-mile railbelt transmission line between Fairbanks and Anchorage.

Present:

L. F. "Lou" Joy, director, Golden Valley Electric Association, president of the Alaska Rural Electric Cooperative Association and NRECA Director for Alaska.

Brene S. Canaday, manager, Golden Valley Electric Association.

Richard B. Smith, director, Chugach Electric Association and director-elect on the Board of NRECA for Alaska.

Paul W. Rohwer, director, Chugach Electric Association and member of the board of trustees of the Northwest Public Power Association.

Gus Norwood, executive secretary of the Northwest Public Power Association.

1. Canaday reported that preliminary cost estimates of a 230,000-volt line, H-frame wood-pole line 325 miles long providing for initial operation at 115,000 volts would cost $12 to $13 million.

He reported steam generation costs at Fairbanks of 27 and 30 mills.

He reported recent construction contracts or estimates as follows: 120 miles Fairbanks-Big Delta 14,400/24,900 volts, with 40-foot full-length pressure treated fir poles at cost of $6,000 to $8,000 per mile; 16 miles of 34,500-volt line with some rock work at $7,500 per mile; 20 miles of 69,000-volt line, Fairbanks to Ladd, using 50- to 60-foot poles, $10,000 per mile.

2. Smith and Rohwer reported on possibilities of using gas turbine generation in the Kenai Peninsula natural gas fields to achieve short-range, low-cost power with low investment. Power as low as 5 mills at the bus bar is indicated. Such power could advantageously be sent to Fairbanks as steam-displacement energy. Brown-Boveri turbines can be installed at about $100 per kilowatt investment.

3. Norwood pointed out that undoubtedly the line investment would be better than the same money placed in new steam generation because of the integration benefits from power pool operation.

He raised the legal question as to whether the Bureau of Reclamation's existing authority in Alaska is broad enough to include construction of this line. Is new legislation needed or can this be done merely by initiating an appropriation, say in the first supplemental appropriations bill next January? This question has been relayed to Senator Gruening's Washington, D.C., office. Assuming that legislation is needed, the simplest approach might be to amend the Eklutna Project Act. A draft of legislation is enclosed.

4. Preliminary Alaska population, as of April 1, 1960, is 224,094 of which the Anchorage-Palmer-Kenai Peninsula area includes 96,505 and the Fairbanks area includes 42,870. The total of 139,375 represents 65 percent of Alaska's population.

5. The Bureau of Reclamation's Susitna River Basin project report contains a map showing a 230,000-volt line between Fairbanks and Anchorage. With minor modifications this map and the related cost data would serve as a project report for this facility. This map and cost data should be available from the Bureau of Reclamation, although the Susitna report is still under review.

The Bureau's plan has the great merit of utilizing the Alaska Railroad as an access road both for construction and maintenance.

6. A 230,000-volt rail-belt line would integrate numerous Federal installations, including many military posts, as well as civilian installations. Many new loads can be expected to develop along the route.

If it is decided to construct heavier facilities in terms of conductor size or use of steel towers, the incremental cost thereof should be chargeable to national defense. Thus, if the basic minimum 230,000-volt facility with initial operation at 115,000 volts would cost $13 million, it is probable that heavy conductor, steel towers for heavy loading, ground wire protection, and 230,000-volt terminal facilities might raise the cost to about $25 million. About half of this would be a reasonable allocation to national defense since the minimum line would be sufficient for the commercial power needs.

The 230,000-volt line would ultimately be usable as a subtransmission line with power flow southward when Rampart Dam is built. The line would be extended to the Rampart Dam site to furnish construction power.

It is assumed that Rampart power would generally be moved to tidewater by means of higher voltage lines of 345,000 or 460,000 volts.

Obviously, it would fit into any future Susitna development.

These considerations based on probable usage under conditions ensuing 20 years from now (midpoint in the life of a wood pole line) fully warrant the higher initial investment and the allocation of the added incremental cost for defense or other national purposes.

7. The Federal Power Commission "Alaska Power Market Survey" of May 1960, provides a useful minimum guide as to Alaska power market conditions up to 1980 or for the next 20 years. May I emphasize that the report represents minimum, in my view, conditions.

8. Checklist of subjects to consider for inclusion in any report justifying the Anchorage-Fairbanks line:

(*a*) History of transmission construction in Alaska, including operation and maintenance as well as construction experience, permafrost, muskeg and rock treatment, etc.

(*b*) List of military loads and resources.

(*c*) List of communities affected.

(*d*) List of existing and prospective generation sources.

(*e*) Report on rail-belt ice and wind loading conditions.

(*f*) Report on lightning conditions.

(*g*) System stability and power factor studies.

(*h*) Studies of probable power flow.

(*i*) Economic analysis and benefits-to-costs evaluation.

(*j*) Review of recent reports on need for power pooling in rail-belt area.

9. It is hoped that utilities in the Fairbanks and Anchorage areas will organize themselves into a working committee to finance and compile or request the governmental agencies to compile the information which Congress will need in justification of the investment.

10. In conclusion our experience in Canada and the Pacific Northwest warrants a strong opinion that the construction of this line will add more dependable capacity to the rail-belt area than the same investment in generating facilities. Furthermore, the usefulness of the transmission investment will be enhanced as generation is added.

Respectfully submitted.

GUS NORWOOD, *Executive Secretary.*

[Draft G.N., Nov. 8, 1960]

AN ACT To amend the Act of July 31, 1950, as amended (64 Stat. 382; 67 Stat. 574–5), relating to construction by the Secretary of the Interior of the Eklutna project, Alaska

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act of July 31, 1950 (64 Stat. 382), as amended by the Act of August 13, 1953 (67 Stat. 574–5), be amended as follows:

(1) By amending the first two sentences of section 1 to read as follows: "That in order to encourage and promote the economic development of Alaska, to foster the establishment of essential industries, to further the self-sufficiency of national defense installations, and to integrate electric plants and loads within transmission distance of the railbelt area, the Secretary of the Interior (hereinafter referred to as the 'Secretary') is authorized to construct, operate, and maintain the Eklutna project in the vicinity of Anchorage, Alaska, consisting of the Eklutna project and transmission facilities to Anchorage and other load centers. The capital investment properly allocable to each unit of said project, including national defense, as determined by the Federal Power Commission, shall be amortized over a reasonable period of years, and interest shall be charged on the unamortized balance of the commercial power investment in said project at a rate of 2½ per centum per annum and shall be covered into the Treasury of the United States to the credit of miscellaneous receipts."

(2) By amending section 6 to read as follows: "There are authorized to be appropriated such sums as may be necessary for the construction, operation and maintenance of such project".

SUMMARY OF PRELIMINARY DATA REGARDING A TRANSMISSION LINE BETWEEN ANCHORAGE AND FAIRBANKS, ALASKA

(Prepared by Robert W. Retherford, Anchorage, Alaska, November 1960)

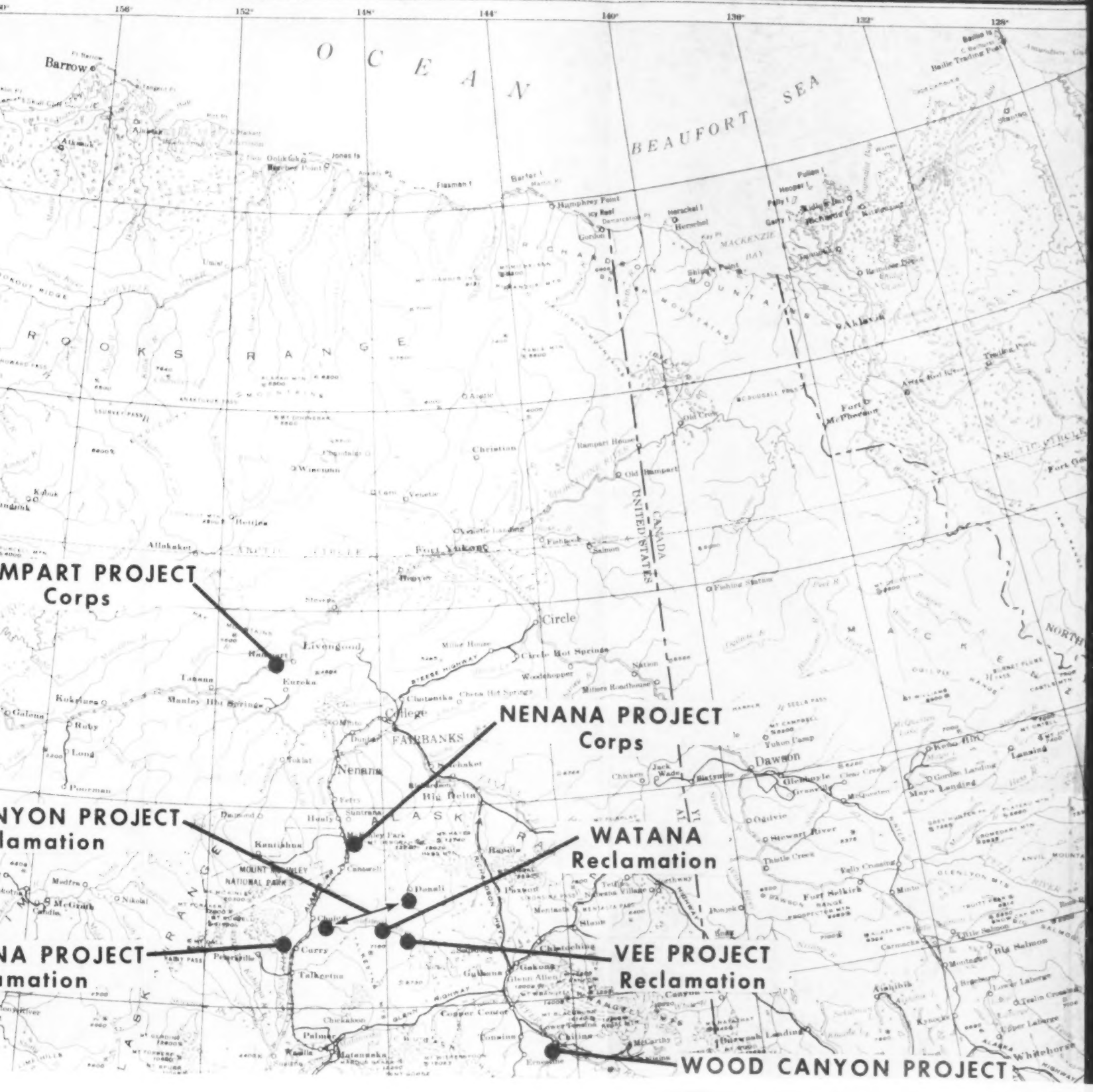
Transmission line costs are based on the following:

(1) The line consists of a 115-kilovolt cable crossing of Knik Arm (provision for a future step-up station 115/230 kilovolts at end of cable), wood-pole H-frame 230-kilovolt line (Drake conductor, 795 MCM ACSR) operated initially at 115 kilovolts with 3 intermediate substations (115×230 kilovolts), 3 10,000 kilovolt-ampere reactors and a 20,000 kilovolt-ampere (115×230 kilovolts) substation in Fairbanks. Based on a 60 percent load factor (which terminal generation will permit), this line would then deliver about 144,500,000 kilovolt-hours initially (at 115 kilovolts). Losses would be about 10 percent under these conditions.

ALASKA MAP A

MAJOR HYDRO

YDROELECTRIC POWER RESOURCES OF ALASKA



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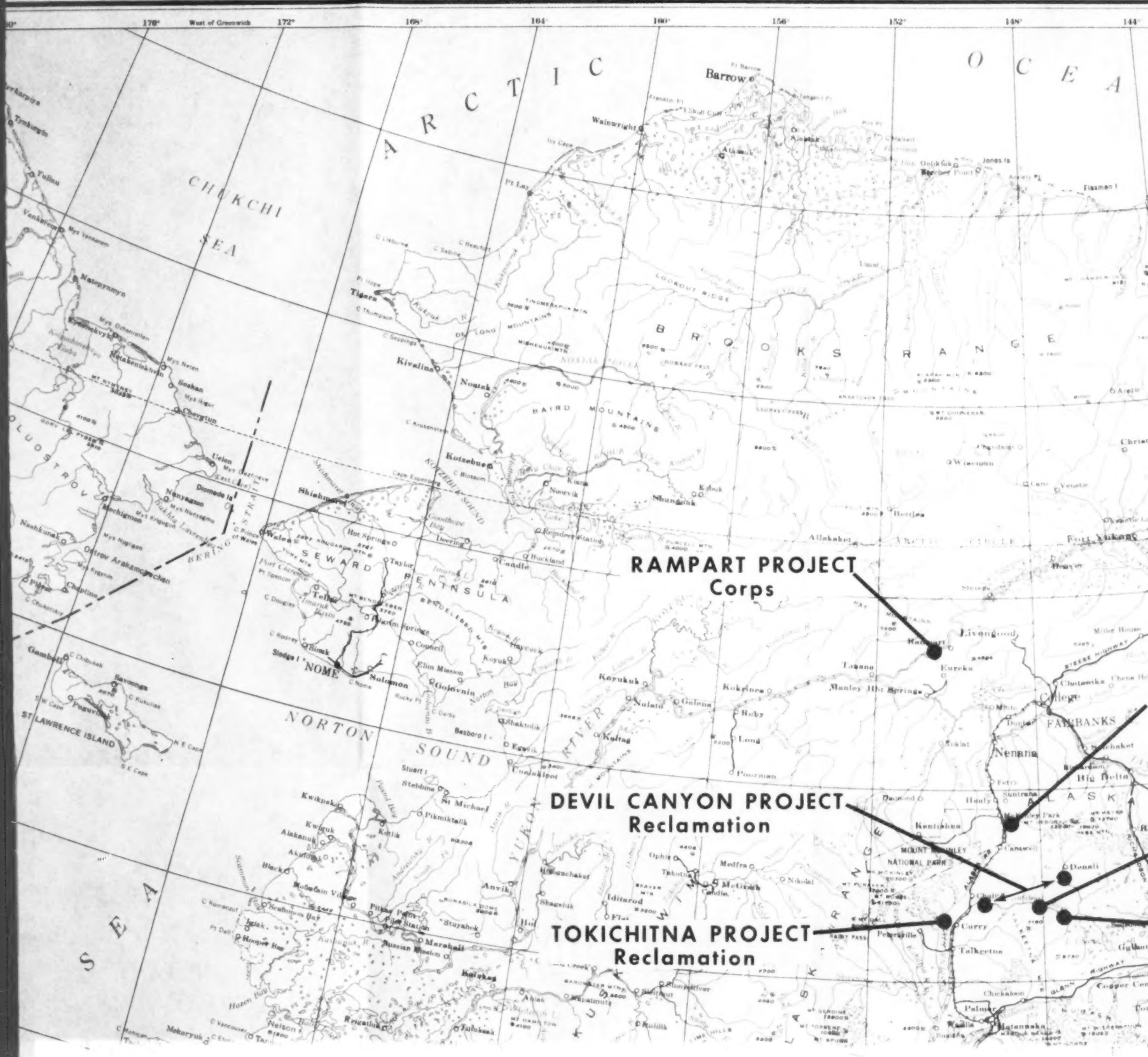

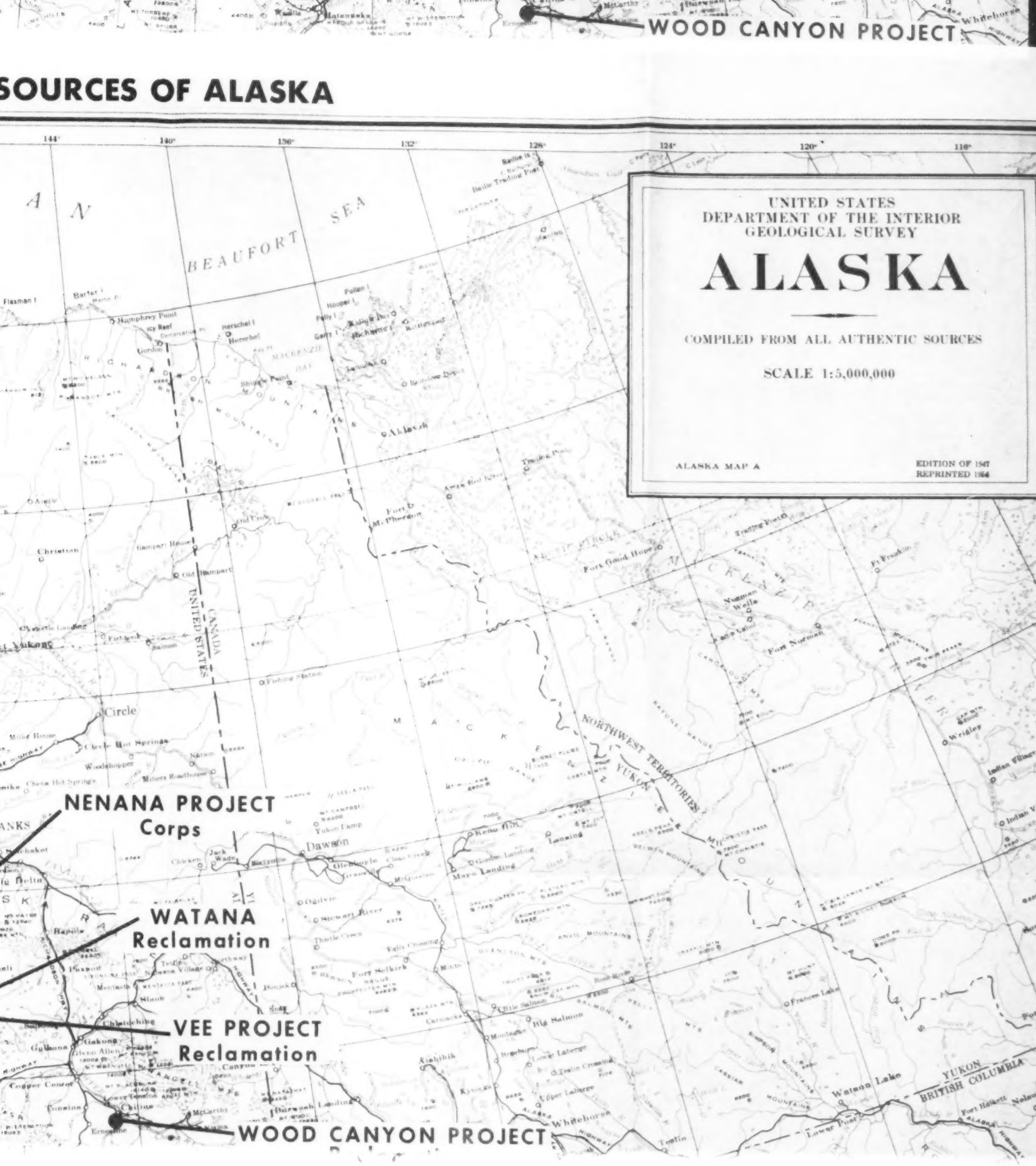
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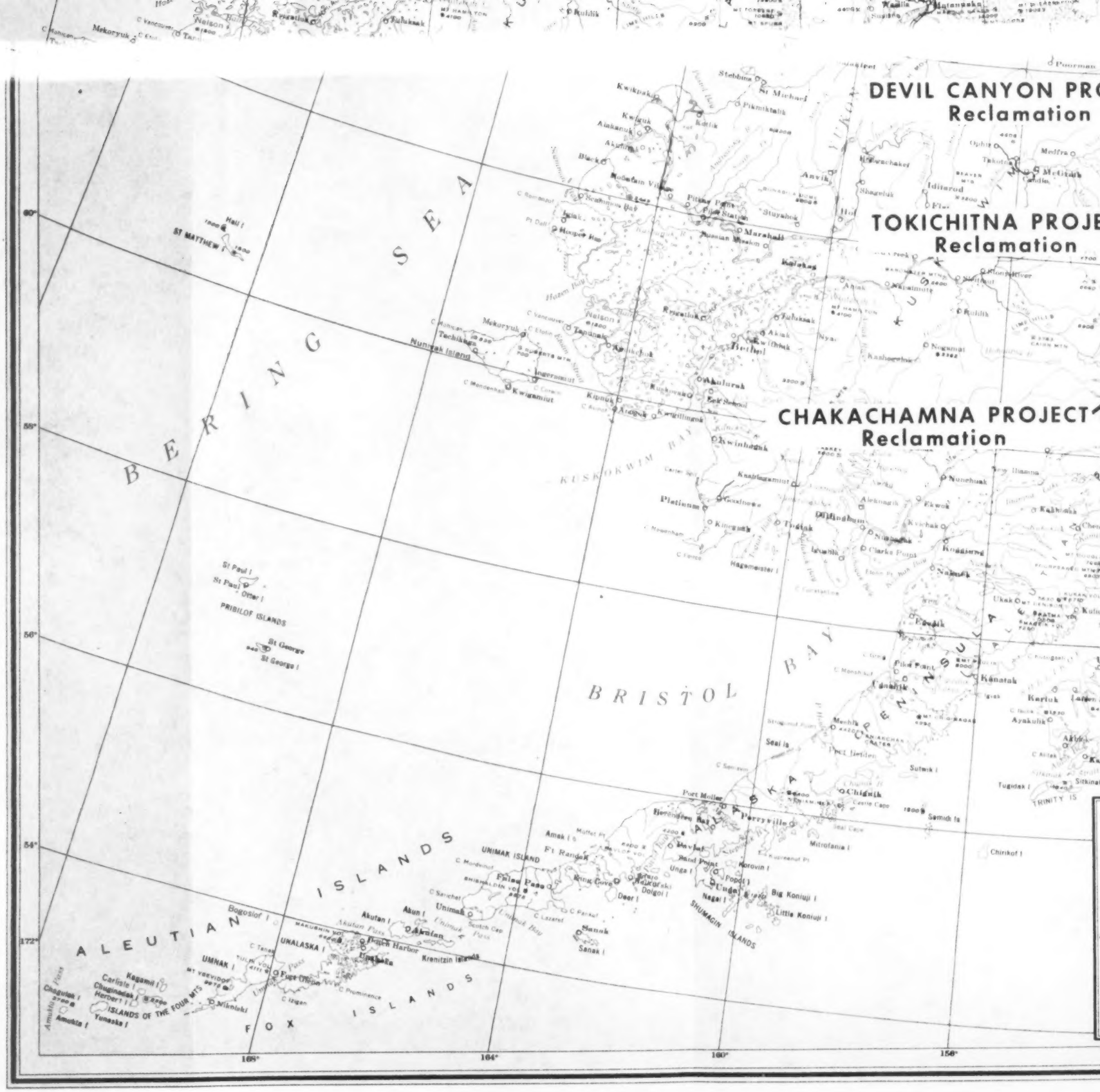
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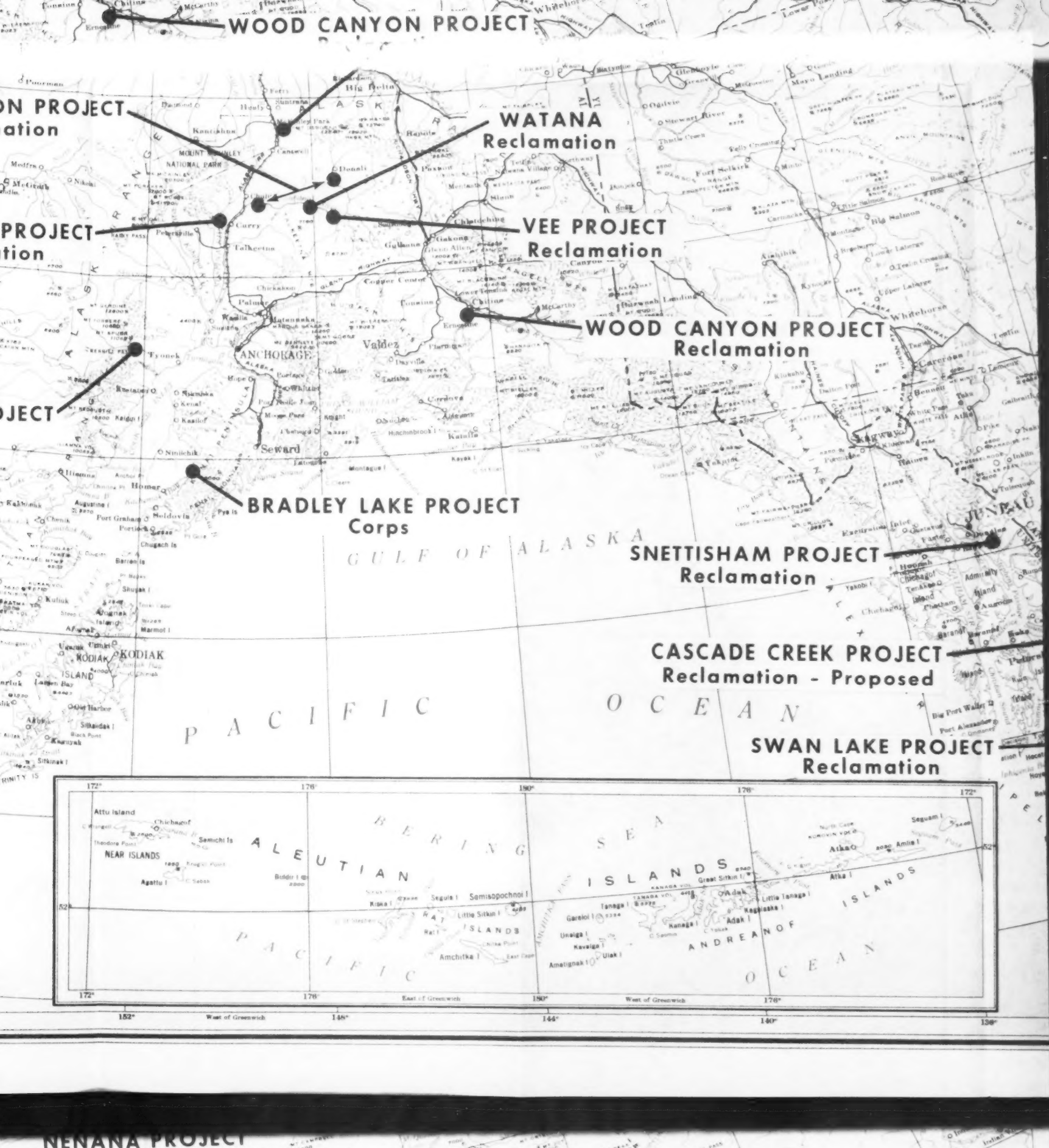
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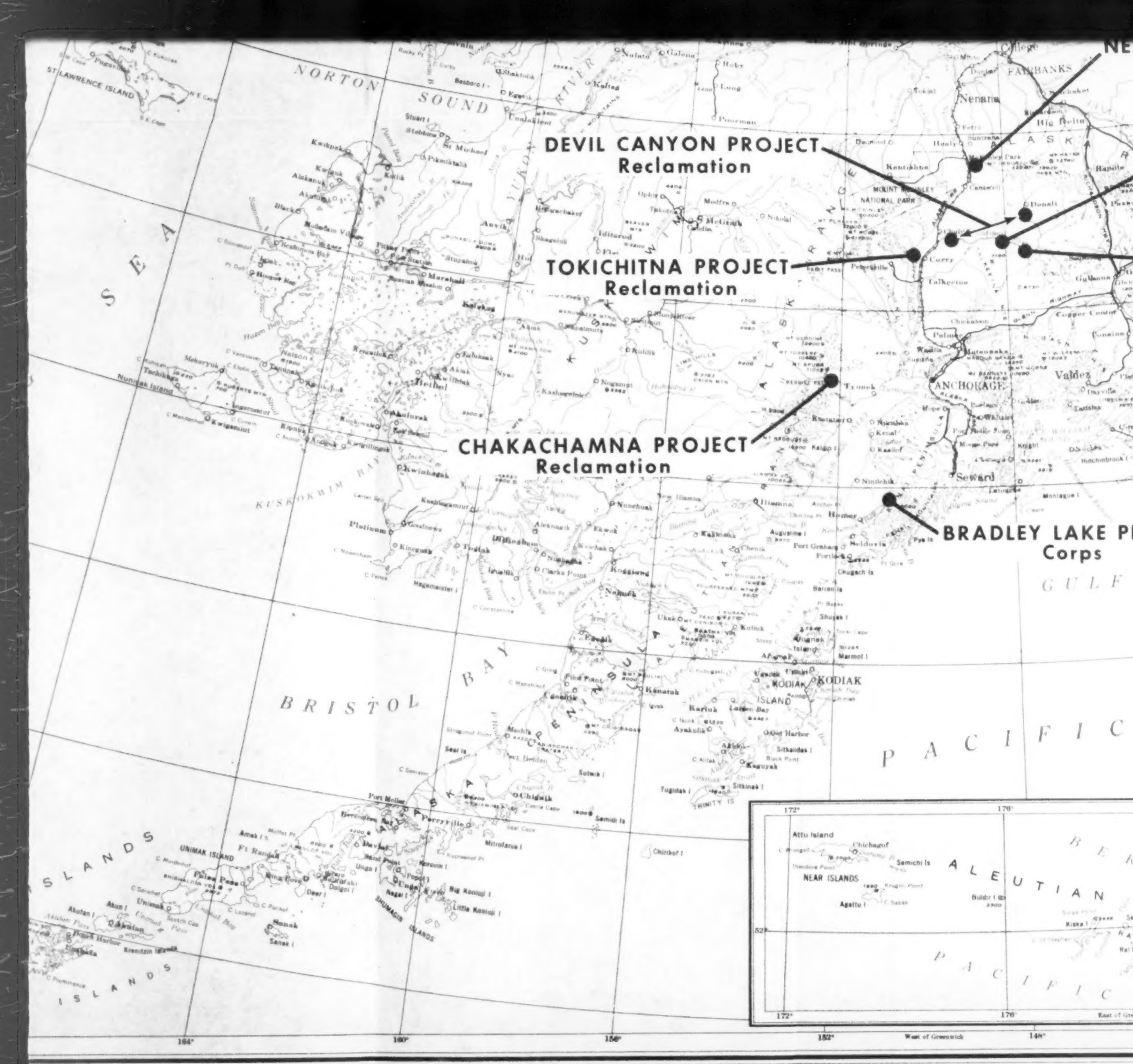
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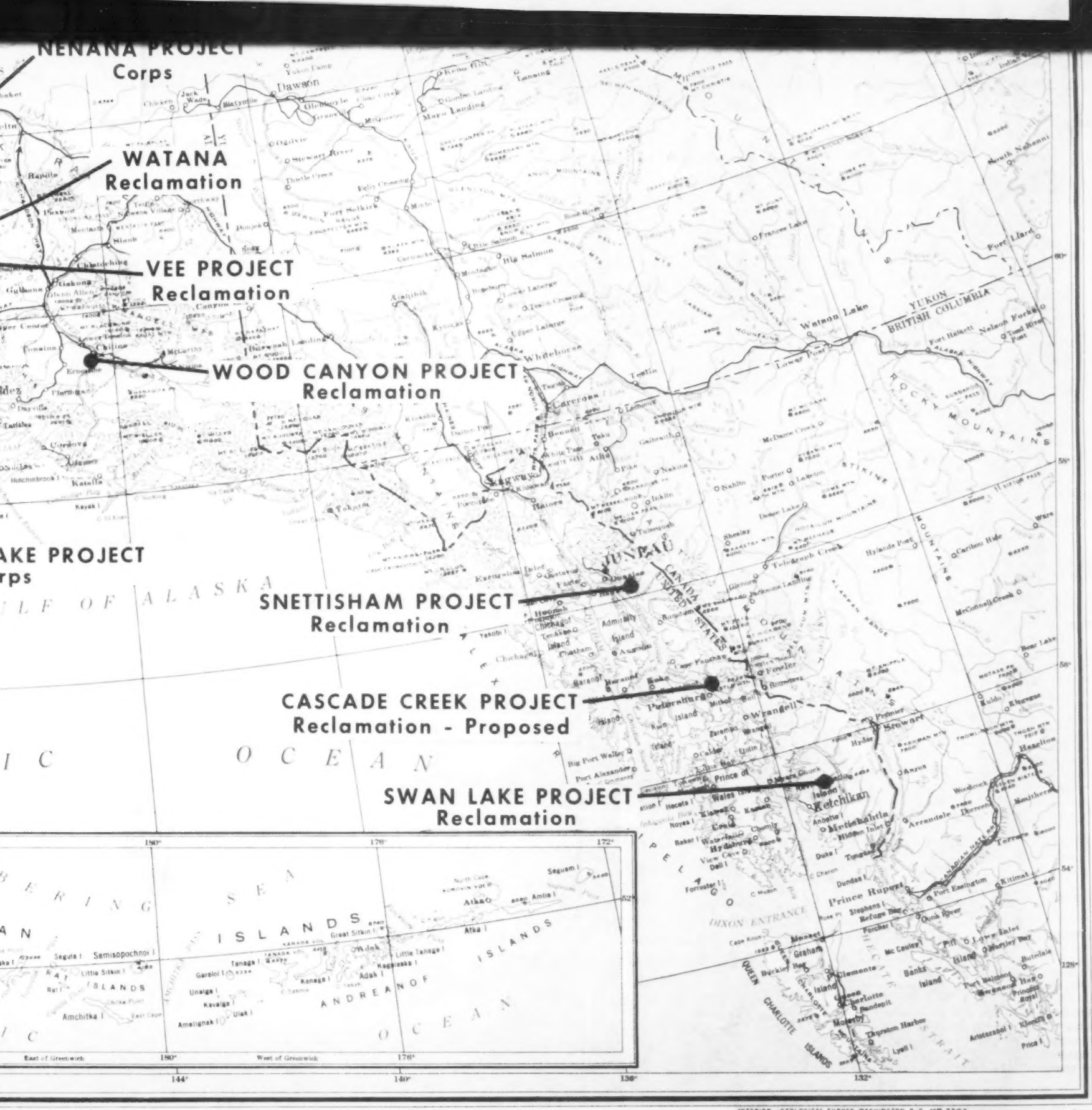

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C. MR 3707

ALASKA
MAP A

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(2) Initial operation at 115 kilovolts is necessary to reduce line charging requirements. The reactors will then provide for practicable operation of the transmission system recognizing the limitations of generating plants at the line terminals. This circuit would transmit 20,000 kilowatts to Fairbanks (at 115 kilovolts) plus an estimated 7,500 kilowatts additional capacity along the way.

(3) Future operation of this circuit at 230 kilovolts would increase the capacity of the line by about four times.

Estimated construction costs:	
Pole line, 327 miles at $33,000 per mile	$10,800,000
Submarine cable crossing Knik arm	800,000
Fairbanks Substation, 20,000 kilovolt-amperes (230×115/69 kilovolts	600,000
Intermediate transformer stations, 10,000 kilovolt-amperes (230×115/25 kilovolts), plus 25-kilovolt reactors, 3 at $275,000	825,000
Total construction costs	13,025,000
Estimated annual operating costs (initial operation at 115 kilovolts):	
Line operation and maintenance, at $250 per mile × 327 miles	81,750
Substations 50,000 kilovolt-amperes, at $0.50 per kilovolt-amperes	25,000
Administration and other	25,000
Line, transformer and reactor losses (14,450,000 kilowatt-hours, at 8 mills)	115,600
Subtotal operation and maintenance costs	247,350

Tranmission costs of energy delivered (before depreciation, interest, taxes and operating margins are $247,350 per 144,500,300): 1.71 mills per kilowatt-hour.

Depreciation, interest, taxes and operating margins will vary with the location of the line and the source of financing. It is estimated that this could vary in the range of 5½ to 10 percent of investment costs annually. This would result in an average overall transmission cost for energy delivered at the low side of substations of about: Anchorage-Fairbanks transmission costs equal 6.7 to 10.7 mills per kilowatt-hour total.

In the future, when loads increase making it practicable to use this line at 230 kilovolts the total costs of transmission from Anchorage to Fairbanks would probably average about 2 to 3 mills per kilowatt-hour total.

It is believed that REA financed organizations could construct and operate such a line for the lower range of costs indicated.

It is further estimated that electric transmission costs from the Kenai gas area to Anchorage over existing (and under construction) and future lines will be about 1 to 2 mills per kilowatt-hour total.

It would also appear not unreasonable to assume that gas transmission costs (via pipeline) may ultimately be competitive with electric transmission and encourage construction of additional generation at other locations than wellhead. This would improve the usefulness of the transmission system and reduce per unit transmission costs.

APPENDIX NO. 3

Hydroelectric Power Potential of Alaska

Alaska Water Resources Hold Much for Future, Corps Says

The Corps of Engineers study of Alaska's water resources directed by the Flood Control Act of 1948 is "one of the most significant and important mileposts of the Corps of Engineers' work in Alaska," according to Lt. Col. William H. H. Mullin, assistant Alaska district engineer.

Lieutenant Colonel Mullin addressed the annual meeting of the Alaska Rural Electric Cooperative Association August 8 at Homer, Alaska.

In studying the hydroelectric power potential, the corps attempted a brief but careful examination of possibilities all over Alaska, to create a "master plan" of water resource development, Lieutenant Colonel Mullin declared. This

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long-range approach was chosen in preference to a short-term study which would have concentrated on fewer sites near immediate load centers with a view toward early construction of some of the smaller plants to meet local power requirements.

The overall study was chosen to "possibly aid in avoiding some of the problems of piecemeal planning that have often hindered full development of our water resources in some of our sister States," Lieutenant Colonel Mullin stated.

"We have not considered all of the possibilities but we feel that we have developed enough information to provide a reasonably firm pattern for future development," he said.

While possible sites which have been studied show a potential power output of 17,800,000 kilowatts, the major portion of Alaska's hydro potential is concentrated in five sites which can be developed to produce over 500,000 kilowatts each, Lieutenant Colonel Mullin said. They are:

Crooked Creek, located on the Kuskokwim River. Drainage area, 30,000 square miles; average annual runoff, 30 million acre-feet; controlled flow, 41,800 cubic feet per second; generation, 825,000 kilowatts.

Wood Canyon, on the Copper River. Drainage area, 21,000 square miles; average runoff, 26.5 million acre-feet; controlled flow, 26,400 cubic feet per second; generation 1,080,000 kilowatts.

Kaltag, on the Yukon River. Drainage area, 296,000 square miles; average runoff, 133.3 million acre-feet; controlled flow, 184,000 cubic feet per second; generation, 2,200,000 kilowatts.

Woodchopper Creek, on the Yukon River. Drainage area, 121,800 square miles; average runoff, 61.2 million acre-feet; controlled flow, 84,500 cubic feet per second; generation, 2,800,000 kilowatts.

Rampart Canyon, on the Yukon River. Drainage area, 200,000 square miles; average annual runoff, 85.5 million acre-feet; controlled flow, 118,000 cubic feet per second; generation, 4,700,000 kilowatts.

The Rampart Canyon project "appears to offer the most immediate promise of any of the large sites investigated," Lieutenant Colonel Mullin said. "This site, fully developed, would generate about 4,700,000 kilowatts of industrial power. Transmission distance to ice-free tidewater ports would not exceed 400 miles and we have every indication that it could be delivered to these potential-use sites at a very attractive price. Our work is not far enough along to put a price tag on this power but we can definitely say that it will be cheap," Lieutenant Colonel Mullin declared.

With statehood and the expected increase in population it will bring, "I feel very strongly that we are now on the threshold of an era of development which has no parallel in history," he said.

Alaska's Hydro Resources Studied—Yukon, Kuskokwim Basins Hold Most Potential Kilowatts

The vast hydroelectric potential of Alaska is detailed in a U.S. Army Corps of Engineers study which shows a total available installed capacity of 17,794,970 kilowatts from a multitude of various-sized projects.

The comprehensive study of Alaska's water resources was directed by the Flood Control Act of 1948. The following summary reflects the preliminary evaluation of hydroelectric power contained in Corps of Engineers reports.

Southeastern Alaska

[Installed capacity in kilowatts]

Mirror, Ella, and Manzanita Lakes	29,600
Swan Lake	15,000
Lake Grace	22,000
Green Lake	4,800
Blue Lake	15,000
Takatz Lake	15,000
Cascade Creek	34,000
Scenery Creek	18,000
Crater Lake	22,000
Long Lake	42,000
Speel River	72,000
Dorothy Lake	28,000
71 additional small sites	471,800
Total	789,200

Neither the Taiya project, proposing diversion of the Canadian Yukon River headwaters to tidewater in Alaska, nor the alternative Canadian Sloko Lake project has been studied by the Corps of Engineers.

Cook Inlet and tributaries

[Installed capacity in kilowatts]

Grant Lake	5,900
Ptarmigan Lake	4,700
Crescent Lake	9,500
Cooper Lake	8,900
Juneau Lake	8,000
Stelter	66,000
Kasilof River	24,000
Bradley Lake	46,000
Halibut Creek	9,000
Eklutna project	30,000
Knik River (Lake George)	200,000
Caribou Creek	48,000
Portage (Devil Canyon)	480,000
Watana	370,000
Denali (Vee)	460,000
Cache	42,000
Talkeetna	90,000
Shell	30,000
Happy River	7,000
Hayes	30,000
Beluga	26,000
Total	1,995,000

Copper River and gulf coast

[Installed capacity in kilowatts]

Wood Canyon	1,080,000
Peninsula	453,000
Nizina River	78,400
Kennicott	17,200
Tebay Lakes	61,400
Bremner River	61,300
Tiekel River	26,700
Tonsina Lake	20,000
Klutina Lake	54,000
Tazlina Lake	74,700
Power Creek	14,500
Keystone Canyon (Lowe River)	31,000
Solomon Creek	4,920
Allison Creek	4,680
Bear Lake	40,000
Lost Lake	3,400
Resurrection River	11,520
Total	2,036,720

Tanana River Basin

[Installed capacity in kilowatts]

Nenana River projects (Nenana, Jack River, Carlo, Yanert, McKinley, Moody, and Slagle) coordinated	237,000
Teklanika River (3 plants)	40,600
Totatlanika River	15,800
Chena River	10,200
Salcha River	21,400
Goodpaster River	8,500
Cathedral Bluffs	108,000
Chisana River	23,000
Total	464,500

Southwestern Alaska

[Installed capacity in kilowatts]

Terror Lake	18,800
Spiridon Lake	5,200
Spiridon River	23,000
O'Malley-Karluk-Frazier Lakes	34,000
Grecian River-Crescent Lake	40,000
Lachbuna Lake (Ingersol Lake)	47,800
Lake Kontrashibuna-Tanalian River	13,900
Tazimina Lakes	50,500
Kukaklek Lake	85,700
Kulik Lake-Nonvianuk Lake	10,800
Nishlik Lake	3,900
Upnuk Lake	10,300
Chikuminuk Lake	51,700
Nuyakuk-Tikchik Lake	93,600
Aguluwak River-Lake Aleknagik	42,300
Grant Lake	11,400
Total	542,900

Northwestern Alaska

[Installed capacity in kilowatts]

Koyuk River	16,000
Fish River	14,000
Kukpuk River	22,700
Pitmega River	5,400
Imuruk Basin	60,000
Kiwalik River	13,500
Kugruk River	14,050
Noatak River	370,000
Total	515,650

Yukon and Kuskokwim River Basins

[Installed capacity in kilowatts]

(The evaluation of the Yukon and Kuskokwim River Basins is not complete, but it is evident that the great hydroelectric possibilities of Alaska are largely located in these basins. A preliminary study of possible projects reveals these sites.)

Kaltag	[1] 2,230,000
Rampart Canyon	[1] 4,770,000
Woodchopper Creek	[1] 2,815,000
Porcupine River	215,000
Nowitna River	28,000
Melozitna River	68,000
Koyukuk River at Hughes	500,000
Crooked Creek (Kuskokwim River)	825,000
Total	11,451,000
Grand total	17,794,970

[1] Assuming no headwater diversion in Canada.

APPENDIX NO. 4

Rampart Dam

Preliminary project data, Rampart project[1]

1. General:	
Stream to be developed	Yukon River.
Site of dam	River mile 756.
Drainage area (square miles)	200,000.
Estimated annual runoff in acre-feet:	
Maximum	102, 500, 000.
Minimum	68, 300, 000.
Mean	85, 400, 000.
Mean annual discharge (cubic feet per second)	118, 000.
2. Reservoir:	
Elevation, full power pool (feet, mean sea level)	660.
Elevation, minimum power pool (feet, mean sea level)	656.
Length (miles—approximate)	400.
Storage (acre-feet)	1, 252, 000, 000.
Area (acres)	6, 945, 000.
3. Dam:	
Type	Concrete gravity.
Elevation, top of dam (feet, mean sea level)	675.
Crest length (feet—approximate)	3, 000.
Height (feet)	500.
4. Power and energy:	
Average head (feet)	440.
Prime power (kilowatts)	3, 735, 000.
Installed capacity (kilowatts)	4, 760, 000.

[1] Source: U.S. Army Engineer District, Alaska, Corps of Engineers.

Rampart Dam—The Big One

Address to the Alaska Rural Electric Cooperative Association at Fairbanks, August 7, 1959, by Harold L. Moats, Chief, Civil Works Planning Branch, Corps of Engineers, Anchorage

It has been said that without dreamers there is no progress. I would like to spend a few minutes discussing a dream which is truly fabulous.

For some years people have spoken of a dam in Rampart Canyon on the Yukon about 100 air miles northwest of Fairbanks. Lots of talk, but nothing accomplished.

It was not until the Corps of Engineers started our report on the water resources of the Yukon and Kuskokwim River Basins in the fall of 1954 that any serious consideration was given at this site.

With a small staff and little money we have made a preliminary evaluation of the water resources of the Yukon and Kuskokwim River Basins. The report is now nearing final form and we expect that it will be submitted in late November or early December. In our studies of the water resources of Alaska we have found it possible to develop about 18,500,000 kilowatts of hydropower. This compared to the 25,500,000 installed hydropower in the smaller 48, provides our long-range planners with some interesting facts to play with.

The major part of this potential power, some 11,300,000 kilowatts, is found at nine sites in the Yukon and Kuskokwim River Basins.

This morning I would like to tell you of some of the things our preliminary studies have revealed about the big one.

The Rampart Canyon site on the main stem of the Yukon River can be developed to produce about 3,700,000 kilowatts of prime power. The installed capacity would be 4,760,000 kilowatts. A concrete gravity dam 1,300 feet long at present water level, 2,700 feet long at the crest, and 500 feet high will develop a usable head of about 440 feet. The regulated flow would be about 118,000 cubic feet per second.

Big figures alone mean little to most of us; let us relate them to others that most of us have seen.

At Rampart Canyon, the dam, with only about three-fourths of the volume of the dam at Grand Coulee, will impound enough water to warrant an installed capacity of 4,760,000 kilowatts; about 2½ times the present installed capacity at Grand Coulee.

The area and capacity of the reservoir is interesting. The reservoir will cover an area of about 10,700 square miles or an area about 10 percent greater than Lake Erie. Due to the great area of the reservoir it is anticipated that the seasonal drawdown will be under 4 feet. The total reservoir storage will be about 1.3 billion acre-feet, better than 40 times the storage at Lake Mead behind Hoover Dam.

There are many interesting areas of speculation that open up as we study this tremendous project.

What, if any, will be the effect of this large reservoir on the climatic regime? It is almost certain that this area of water would increase precipitation to some extent. The water mass would cause the mean annual temperature to rise—how much we cannot say—but assuming that it might be 2 or 3°, it is interesting to note that a few days longer growing season would enhance the agricultural potential of the region.

It has been said that the reservoir area contains enough timber to sustain a small pulpmill during the filling period.

The short but extremely pleasant summer weather of the region might well induce recreational activities here that would compare favorably with those at some of the popular reservoirs in more populated areas.

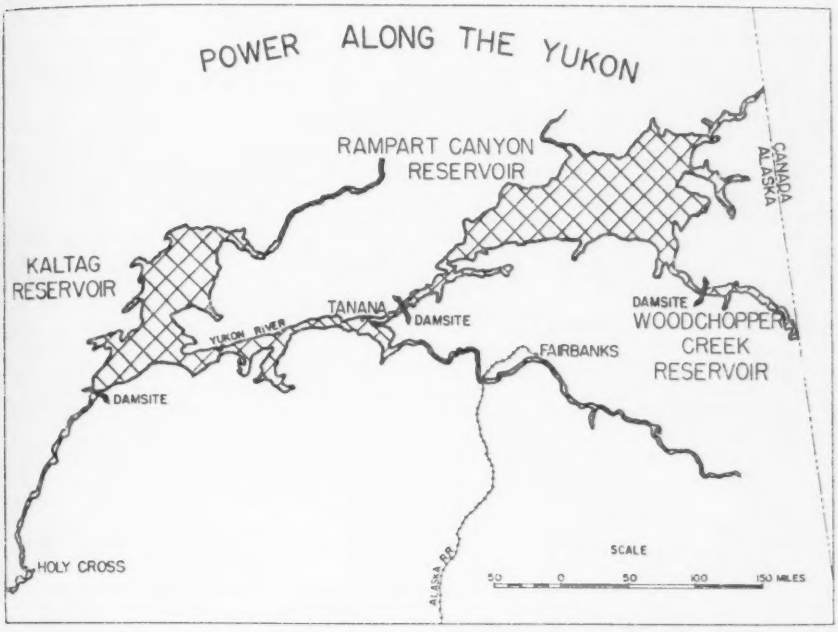
Let us look more closely at the structure itself. The dam will be a gravity arch structure with adequate fish-handling facilities. Cargo-handling facilities would be constructed in lieu of locks. Because of the huge reservoir capacity it is anticipated that a spillway, required for safety, will never be used, and it is tentatively planned that the spillway function will be provided by a rupture section in the low earth levee which will close the saddle in the Texas Creek drainage opposite the main dam.

Power will be developed by seventeen 280,000-kilowatt generators.

It is anticipated that ultra-high-voltage transmissions, probably about 500,000 volts, will serve ice-free industrial sites at Valdez, Anchorage, Whittier, and

Seward. Fairbanks and other interior communities, as well as many mining operations, will be served by conventional transmission lines.

The construction of the dam in stages will probably not prove feasible because of the high cost of mobilizing men and equipment. Our tentative plan, therefore, is to initially construct the entire dam and to install four or five of the 280,000-kilowatt generators. Installation of the remaining generators will follow as the load develops.



Proposed reservoir larger than Lake Erie

Preliminary estimates indicate that the cost of this initial installation, including transmission to one ice-free tidewater industrial site, will be about $900 million and that the delivered cost will be about 5 mills per kilowatt-hour. The total installation will cost about $1,340 million and the kilowatt-hour cost at the tidewater sites mentioned above will be reduced to about 3½ mills.

Based primarily on these results of our preliminary studies, the Public Works Committee of the Senate, at the request of Senator Gruening, on April 24 of this year directed that the Corps of Engineers make a detailed study of the Rampart Canyon hydroelectric site. We anticipate that this study will require 4 years to complete and that we will receive an initial allotment of funds to start work this fiscal year.

THE "BIGGEST DAM" ON THE MIGHTY YUKON

(By George Sundborg, administrative assistant to Senator Ernest Gruening, of Alaska)

Alaska, supplanting Texas as the biggest State, has a lot of other "biggests" and "mosts" to call to the attention of the Nation.

The 49th State has a coastline several times longer than that of all the other maritime States combined. It has at least 15 mountains, all of which are higher than any in the "Lower 48." It has the biggest moose, biggest salmon, longest days, coldest winters. It is the home of the largest carnivorous animal on earth—the Alaska brown bear.

Now Alaska comes to the fore with a proposal for construction of the biggest hydroelectric power project in the world—nearly three times as big as Grand Coulee, producing more energy than all of the dams of TVA combined.

Recently the Senate Public Works Committee adopted a resolution calling on the Corps of Engineers to "determine the advisability of improvements in the interest of hydroelectric power and other water uses in the Yukon Basin, Alaska, with particular reference to the Rampart Canyon site."

Rampart Dam, if built—and Alaska's congressional delegation would quickly correct that to "when built"—will dwarf any powerplant now in production anywhere in the world. Its installed capacity of 5 million kilowatts would compare with a total of 1.9 million at Grand Coulee, the biggest dam under the American flag. Even the Russians, making rapid strides in the development of hydroelectric energy, do not yet have anything as big as Rampart, though dams as big are said to be on Soviet drawing boards.

The Yukon River is the third largest on the North American Continent, after the Missouri-Mississippi and the Mackenzie. Along its 2,000-mile course within Alaska, not a single dam bars or slows its flow.

Rampart Dam would be 400 feet high and a little more than half a mile long at the crest. It would impound 1.5 billion acre-feet of water covering 10,000 square miles, creating a lake as big as one of the Great Lakes. Meteorologists say the existence of such a lake would substantially modify the climate of interior Alaska.

Harnessing the Yukon River at the site provided by the rock walls of Rampart Canyon would produce electric power which would cost about 2 mills per kilowatt-hour at the bus bar, preliminary studies indicate. The site is 90 miles northwest of Fairbanks and 300 miles due north of Anchorage, the two largest cities in Alaska, to which needed power could be transmitted from the huge dam.

"There is no question," Senator Ernest Gruening (Alaska) stated in a letter to Senator Dennis Chavez (New Mexico), chairman of the Public Works Committee, requesting the resolution, "that, with the availability of the tremendous amounts of low-cost electric power which could be produced at Rampart, further industrial development of the entire region would be rapid indeed."

The Senator emphasized that it is of greatest importance that studies preliminary to construction be undertaken as soon as possible. He noted that at best many years will elapse before power from the dam will be available, even with the early start envisioned by the Public Works Committee resolution.

The Corps of Engineers, which has had a preliminary look at Rampart Canyon in connection with its interim report on the Yukon and Kuskokwim River Basins, estimate the cost of a dam and power facility there at between $900 million and $1.5 billion, depending on the size of the power installation.

Whether the dam would be built of concrete or would be of rockfill construction with a concrete spillway is a matter to be determined in the course of the investigation which the Corps of Engineers has been directed to make. Some who have looked at the site estimate that a dam could be built there which would produce energy for as little as 1 mill per kilowatt-hour.

Rampart is the largest and key structure in what Alaskans envision as a future power empire, surpassing even the Columbia River in capacity and cheapness of energy. The new State has a total hydroelectric power capacity at known sites of more than 50 billion kilowatt-hours annually. Less than one-fourth of 1 percent of this potential has been harnessed.

Noting that the Russians have embarked on a 7-year program of Siberian development which will include building dams twice as big as Grand Coulee, Senator Gruening remarked recently on the Senate floor that, "What Russia is doing in Siberia represents a specific challenge to the United States to do no less in the area which was once Russian America—for 92 years the district, and then the territory of Alaska, and now the 49th State.

"In physical terms, Alaska is America's equivalent of Asia's Siberia. It lies in the same latitude. It has corresponding climates. It has undeveloped natural resources. It has the greatest undeveloped power potential on the North American Continent * * *.

"The construction of a mighty dam and hydroelectric facility at Rampart Canyon, on the Yukon, will provide the United States with the largest source of hydroelectric power yet developed."

Rampart is the most promising of the Alaska sites studied so far. But three others also offer prime power of more than 1 million kilowatts each. Two of them, Kaltag and Woodchopper, lie in the same basin as Rampart. This trio of sites offers a prime potential of more than 6 million kilowatts. The fourth site of 1-million-kilowatts-plus is Wood Canyon on the Copper River, near the gulf coast of Alaska.

In addition, the Army Engineers list nine more sites with prime potentials of more than 100,000 kilowatts, and seven other sites of between 50,000 and 100,000 kilowatts of prime power.

Just one Federal project exists in Alaska today. That is Eklutna Dam with an installed capacity of 30,000 kilowatts. This Bureau of Reclamation operation serves Anchorage and its environs through the Chugach Rural Electric Cooperative and the city system. The REA has done a fine job in moving along some of our smaller projects. As of last March 31, REA had loaned a grand total of $43,845,000 for Alaska generation and distribution facilities. An example is Cooper Lake, where a 15,000-kilowatt project is now under construction, financed by a $13 million REA loan. REA financing has accounted for 33,100 kilowatts of installed capacity in our State.

Rampart is obviously of a different magnitude. It is for the future. Under optimum conditions, the Corps of Engineers estimates it can begin to produce energy in 1972. This timetable contemplates 3 years for the studies now authorized, 2 more years to design the dam and then 8 years to build it.

Just to fill the huge reservoir behind Rampart would take nearly 20 years, under a regimen of one-fourth use and three-fourths storage. Some power production would be possible from the first year, at the end of which the head would be 173 feet. When in full operation, the annual drawdown would be only 2 feet. Because of the vast storage and great depth of the lake, the operation would not be affected even by the 70-below zero winter cold of the area.

What we know today about Rampart is not much. It is based on reconnaissance-type surveys conducted by the Corps of Engineers and Bureau of Reclamation. But available information is enough to prove that here can rise the biggest dam in the free world. The Alaska delegation in Congress has devoted its energies to bringing that about.

APPENDIX NO. 5

Anchorage Area Power Resources

A. Natural Gas

[From Anchorage Times, Oct. 7, 1960]

City Is Offered Electric Power From Gasfields

Alaska Power Co., now being formed, yesterday offered to supply the city of Anchorage with electric power generated by gas turbine at the Kenai natural gas field to meet impending power shortages.

Henry Zenzie, president of Development Corp. of Alaska, and Robert W. Retherford, consulting electrical engineer, appeared before the city council to lay out the plan. Zenzie and Retherford, an owner of North Pacific Consultants, Inc., will be stockholders in the new company.

We make "a proposal to supply electric power to the city of Anchorage on a long-term firm basis to assure adequate low-cost power supply for the future needs of the city utility system," Zenzie said.

"Average costs of power to the city under this proposal would be about 11 miles per kilowatt-hour," Zenzie said. "Additional nonfirm (power periodically in excess) energy delivered to Anchorage would be available at 5.5 mills per kilowatt-hour," he explained.

The council, meeting during a vote canvass, directed the city electric utility department to study the plan and compare costs of the gas power with possible power costs from other sources. Included would be the Devil's Canyon hydroelectric project.

Zenzie and Retherford again are to appear before the council Tuesday to explain the offer.

The company contemplates purchase of natural gas from any of three existing sources in the Kenai field. The three companies are Standard Oil Co. of California, Union-Ohio Oil Co., and Halbouty Alaska Oil Co.

Planned is a plant costing about $2.5 million at the well sites, capable of producing 130 million kilowatt-hours annually, Zenzie said. Approximately seven persons would be employed when the plant was in operation.

Use of the Chugach Electric Association's transmission line from the Kenai area also is contemplated, Zenzie said.

Zenzie said a New York investment firm is willing to share in capitalization of the new company.

The new power source would save the city approximately $1 million in the next 10 years "under the proposed contract as compared with the lowest cost plan developed by the (city) power generation study recently completed," Zenzie said.

Under the proposed contract the company offers "an initial firm commitment of 8,500 kilowatts of power" which could rise to 14,000 kilowatts in 1968 to aid in meeting the city's expected power demand of 36,250 kilowatts by 1970.

The new power could be supplied to the city within 18 months after a contract was signed, Zenzie said. He said the city presently is paying 6 mills for Eklutna hydroelectric power compared with the company's offer of eventual 5.5 mills per kilowatt-hour. Minimum charge to the city would be $531,250 annually.

"The Alaska Power Co. has also offered to deliver nonfirm energy to the Chugach Electric Association, Inc., and the Homer Electric Association for 4.5 mills (at the Kenai well site) and offered to buy wheeling privileges over the CEA-HEA transmission system," Zenzie said. The co-ops are being offered 1 mill per kilowatt-hour for use of their lines, he said.

The company is seeking a meeting with the CEA board on the proposal, Zenzie said.

Meanwhile, independent of the offer, the CEA staff has made a study of use of gas for electric generation, said CEA Manager Erling Orwoll and General Superintendent Ralph Johnson.

By use of gas turbines at the well sites, CEA could begin producing 15,000 kilowatts at 7.5 mills, and by 1970, 60,000 at 4.23 mills, the officials said. This includes cost of transmission.

Under restriction of the Rural Electrification Administration, the CEA cannot borrow funds to offer firm power to the city, Orwoll said. But it can offer nonfirm or dump power from additional generation units it builds.

Whether gas generation could be extended to an Anchorage-Kenai-Matanuska Valley power pool is being studied by members.

[From Anchorage Daily Times, Oct. 10, 1960]

NATURAL GAS OFFER HAS ITS ATTRACTIONS

The offer to provide electrical power generated by gas turbine at the Kenai Peninsula natural gas fields may prove very tempting to the city.

The proposal is not, however, something to grab at without a full understanding of the cost, dependability of service, and many other factors that will be involved.

The Alaska Power Co., a newly organized firm, has proposed to supply the city with power.

On the surface, the offer was an attractive one. At this early date, though, there are so many unknown factors that a hasty decision could spell trouble later on.

It is a generally accepted theory that Anchorage will need a greater supply of power in the next few years than is available now.

The city now receives its power from the Bureau of Reclamation's Eklutna hydroelectric plant and from diesel generating plants.

In its proposal to the city council last week, officials of the company that has offered gas-generated power estimated that the city could save about $1 million during a 10-year period. The saving would result from power that costs less than that anticipated in a recent power generation study performed by an engineering firm.

The proposal contemplates installing a gas turbine at the natural gas field on the Kenai Peninsula. The electrical power would arrive in Anchorage via transmission lines.

Capital to finance the new company would stem from New York financial circles, it was indicated.

It certainly is worth the time and effort of the city council to investigate fully the proposal to utilize gas-generated power.

Natural gas is one of the newest and potentially great resources discovered in large quantities in Alaska in modern times. Its discovery has raised the curtain on a new era of resource development and economic growth.

The fact that outside capital has expressed an interest in investing here is an encouraging sign. Alaskans for years have been trying to attract venture capital from the financial circles of other States.

The estimate that the city could receive lower cost electrical power is an attraction.

There are many interesting factors in the proposal to furnish a type of power that Alaska has never been able to use.

There are potential pitfalls, too. How reliable will the natural gas power be? Is the ultimate capacity large enough for the city to stake long range power program on? Who are the principals involved and are they reliable?

The offer of gas power has unlimited possibilities. It should be considered seriously. It should not be done hastily, though.

[From Anchorage Daily Times, Oct. 11, 1960]

GAS MAY HELP SUPPLY ALASKA'S POWER NEEDS

South-central Alaska and the Fairbanks area "require new starts immediately" in electric power development and natural gas can be a source of low-cost generation for domestic uses, the Greater Anchorage Chamber of Commerce was told yesterday.

A survey of the country's—and Alaska's—power needs was given by Robert Retherford, electrical engineer, at the chamber's weekly luncheon in the Anchorage-Westward Hotel. Retherford is a partner in North Pacific Consultants, and a founder of Alaska Power Co., now being formed.

Electric power is a problem in the isolated communities of Alaska, Retherford said. "Homer, Seward, Anchorage, Palmer, and Fairbanks are in a better position than some, but they will need additional power," he claimed.

Hydroelectric projects, and mine-mouth generating plants to serve these isolated communities are being considered but their "price tags" seem high, Retherford explained.

"Recently into the picture has come a low-cost fuel—natural gas—discovered about 15 months ago on the Kenai Peninsula—in sufficient supply for large usage," Retherford said. "One of these is generation of electricity."

Although there are "no gas generation plants in Alaska," the natural fuel is being used for electric generation in other parts of the world, Retherford continued.

Locally, cost of gas-generated power "would be competitive with the Bradley Lake hydroelectric project," now on the drawing boards, Retherford said.

The Chugach Electric Association, Homer Electric Association, and the Alaska Power Co., are interested in the possibilities of the fuel for domestic electricity, he added.

"In large blocks," gas-generated power would even be competitive with hydroelectric current for industrial uses, Retherford contended.

In reviewing the Nation's power resources, Retherford observed that electric power generation serves two purposes which can carry two prices.

"One purpose is for comfort and convenience (domestic use)," and the second is to supply "the majority of the tremendous energy of commerce (industrial use)," Retherford maintained.

"The price you pay for domestic use can be more than that for industrial use because (the latter) is in competition with the rest of the world," he said.

The Nation faces a power shortage, Retherford said. Quoting Ivan Bloch, his partner in North Pacific, in testimony before the U.S. Senate Committee on Interior and Insular Affairs, Retherford noted that the aluminum industry alone will be required to have a 16-million-ton capacity by 1985. This "will necessitate providing around 17 million kilowatts of firm power at low cost."

"I believe it fair to state that, by the 1980's, we will be scraping the bottom of the national hydroelectric barrel with the exception possibly of the Pacific Northwest and certainly of Alaska," he quoted Bloch as saying.

In reply to a question, Retherford said the use of nuclear power for generation "is a little more disappointing than thought" when the program was first launched.

There is a feeling among developers that "gas has not been drilled for in many places in Alaska that it could be," Retherford said. Its development in electric generation "brings in a competitive force which could result in lower cost power overall," he said.

Area Cooperatives Eye Gas Generating Plants

(By Clarke Ward, Times staffwriter)

Generation of electric power with natural gas, which "may be the salvation for the south-central area to take care of new power needs during the next 10 years," is being considered by area electric cooperatives, said Chugach Electric Association Manager Erling Orwoll today.

CEA, Homer Electric Association, and Matanuska Electric Association, the three participating co-op members of the South-Central Alaska Power Pool, are studying feasibility of gas generation, Orwoll said.

If the CEA board approves, the CEA would apply to the Rural Electrification Administration for an estimated $9.2 million over the next decade to finance construction of gas turbine powerplants—burning waste gas from oil wells at the Kenai Peninsula well sites, Orwoll explained.

It also would apply to the U.S. Fish and Wildlife Service for permission to construct the generating plants and transmission lines in the Kenai Moose Range, he added.

At a meeting last week, the other members of the pool were presented results of a gas generation study prepared by the CEA staff under direction of Orwoll and General Superintendent Ralph Johnson. Other participating members of the pool are the Anchorage and Seward electric utility departments. Advisory members are the Air Force Alaskan Command, U.S. Army Alaska, the Corps of Engineers, the Bureau of Reclamation and the REA.

The HEA could benefit directly from the proposal, Orwoll said, since it is a customer of CEA. The Kenai Electric Association—soon to become a customer—also could, he said.

Other members of the pool also could be served by CEA, with firm power in the case of the MEA and nonfirm to Anchorage and Seward and to the military. REA restrictions prevent CEA from selling firm power to other than co-ops, Orwoll said.

To show the need for low-cost power within 10 years, the study estimates total peak needs in the area will be 120,700 kilowatts. This includes the potential demands of CEA, HEA, MEA, Anchorage and Seward, the report indicates.

Present area needs of 46,100 kilowatts are being met by city generating plants, the CEA Knik Arm plant, and the Bureau of Reclamation's Eklutna hydroelectric project, which vends power to the local utilities.

Next year, the CEA's Cooper Lake hydroelectric project will go on the line with 17,000 kilowatts peak load capacity, bringing total available power to about 62,500 kilowatts.

Orwoll and Johnson emphasized that the estimates of rising demand "were conservative." They do not include demands from any possible large industrial installations nor the military.

Gas generators can be put into operation within 18 months, the officials said, compared with 7 to 9 years for large hydroelectric projects, such as Rampart on the Yukon River and Devil's Canyon on the Susitna River.

The projected Bradley Lake hydro facility, while it could be built in 5 years, would not be "competitive" in cost with gas generation, they estimate.

While gas power is "not quite as low a cost power" as hydro "it is more liquid" in that "new units can be added to come on the line faster" to meet new demands for electricity, Orwoll said.

Furthermore, gas generation requires less capital for construction than the hydros, the officials added.

For the estimated $9.2 million, gas generation facilities can be constructed with twice the output of the Eklutna hydroelectric project, which cost $33 million, Orwoll asserted.

Another advantage of gas power to fill the gap in the next 10 years is that "it would speed up the big hydro projects," Orwoll maintained. Available gas generated power would "create a demand" for large blocks of industrial power which make the hydro projects feasible, he said.

CEA To Ask Review of Gas Power Plan—If Government Agency Approves Idea, Engineering Study Next on Schedule

(By Clarke Ward, Times staffwriter)

The Chugach Electric Association board of directors last night decided to request an official of the Rural Electrification Administration to come from Washington, D.C., to review plans for generating low-cost power by means of gas turbines for the south-central Alaska area.

If use of the new fuel on the Kenai Peninsula for electric generation is approved, the CEA will hire a firm of consulting engineers to put the plan into proper form for bidding and construction, said Erling Orwoll, CEA manager.

Being hailed by several engineers as a method of filling the area's demands for electric energy for the next 10 years, gas generation is said to be looked upon favorably already by the REA in Washington.

The REA loans necessary capital to the local electric co-ops for development of energy sources—thus far limited to hydroelectric, steam and diesel power.

That the south-central region is facing a power shortage soon is evident in "conservative" estimates of future demand set forth by the city of Anchorage and CEA. The latter guesses by 1970 peak requirements will be 120,700 kilowatts.

By next year when the CEA's Cooper Lake hydro turbines start turning total output of the area including the military installations, will be 51,000 kilowatts, it is estimated.

According to CEA Manager Erling Orwoll and General Superintendent Ralph Johnson, that the gap will be filled by adding hydroelectric projects seems slim since the larger installations take 7 to 9 years to build.

The smaller Bradley Lake project proposed at the end of Kachemak Bay might require only 5 years to construct, they said. But 150 miles of transmission lines to the CEA's service area lessen the attractiveness of its output as low-cost fuel, the officials indicated.

Gas generation appears so feasible, the CEA is holding up plans for diversion of two streams into the Cooper Lake project while the gas potential is being studied, Orwoll said.

Readvertisement of bids on the diversion of Stetson Creek and of Porcupine Creek is being delayed, he explained. Stetson project was to increase output by 1,500 kilowatts at an estimated cost of $400,000 to $500,000. Porcupine was to produce 300 kilowatts at a cost of about $300,000.

Bids this summer were turned down as being too high, Orwoll added.

Orwoll and Johnson envision gas-turbine installations at the Kenai oilfield, which by 1970 will be producing 60,000 kilowatts at peak.

Estimated cost of the power per kilowatt-hour will be 4.23 mills compared with an estimated 1.035 cents per kilowatt-hour for power purchased from Eklutna, and with 1.57 cents for production at Cooper Lake, the officials said.

Total output of CEA's generating complex by 1970 could be 131,000 kilowatts at peak, the study shows. This would be 60,000 from gas turbines, 34,000 from Eklutna, and 17,000 from Cooper Lake (not including Stetson and Porcupine diversion). The Knik Arm steampower plan, which can produce 15,000 kilowatts, would be placed on standby for emergencies. Composite cost of production would be 7.85 mills per kilowatt-hour.

The study suggests investment of about $9.2 million over a 9-year period in gas-turbine installation. Units, about 10 by 70 feet, of 15,000 kilowatts peaking capacity would be installed at Kenai next year, in 1964, 1967, and 1969.

For each installation, the turbine units would cost about $1.2 million each; housing $50,000 to $100,000; two substations, $200,000 to $3 million, and controls, $50,000 to $100,000.

For transmission of the power, the CEA in 1961 would string 15 miles of line with 69 kilovolts capacity from the wells to Sterling to tie in with existing CEA distribution web. This would cost approximately $300,000.

When output reaches 30,000 kilowatts (in 1964), another line would be added 93 miles from the generators to Turnagain Arm to hook onto the Cooper Lake transmission line. This would have a load capacity of 110 kilovolts and cost about $2,700,000.

The lines would be capable of handling additional loads as future generating units are added.

With telemetering equipment, CEA's entire generating capacity could be controlled from its Anchorage office.

Orwoll and Johnson agree that "hydro generation in large units is the answer to low-cost power, but gas generation is an economical means of meeting the area's demands in the next decade."

Furthermore, a low-cost supply of gas power "speeds up construction of the big projects, because it creates demand," they say.

B. Bradley Lake Hydroelectric Power

Source: U.S. Army Engineer District, Alaska, Corps of Engineers.

Preliminary project data, Bradley Lake, Alaska

1. General:	
Main stream to be developed: Bradley River.	
Partial diversions: Nuka River and North Fork Bradley River.	
Site of dam: Bradley River Mile 9.8.	
Drainage area, including diversions, square miles	68.3
Estimated annual runoff in acre-feet, including diversions:	
Maximum	552,000
Minimum	256,000
Mean	354,000
Mean annual discharge, cubic feet per second	415
Spillway design flood, cubic feet per second	19,000
2. Reservoir:	
Elevation, full power pool	1,196
Elevation, minimum power pool	1,090
Length, miles	4
Area at full power pool, acres	3,900
Area of minimum power pool, acres	1,550
Power pondage, acre-feet	311,000
Pondage below minimum power pool, acre-feet	242,000
3. Dam:	
Type: Rock fill with impervious membrane.	
Elevation, top of dam, feet, mean sea level	1,215
Maximum height, feet	150
4. Spillway:	
Type: Free overflow.	
Overall, width, feet	150
Crest elevation, feet, mean sea level	1,196
5. Outlet works:	
Type of operating gate: Slide gate.	
Number and size of operating valves: one 6 feet by 8 feet.	
Size of conduit, diameter in feet	8
Capacity at maximum pool, cubic feet per second	3,850
6. Power tunnel:	
Type: Concrete lined.	
Control: two 6 feet by 8 feet; slide gates.	
Diameter, feet	11
Length, feet	14,900
7. Penstock:	
Type: Steel.	
Diameter, feet	8
Length, feet	4,500
8. Power and energy:	
Maximum head, feet	1,146
Minimum head, feet	1,040
Average effective power head, feet	1,105
Number of generators	3
Type of turbines: Impulse.	
Revolutions per minute	400
Turbine rating, horsepower	14,900
Generator rating (nameplate), kilowatts	21,300
Total capacity, kilowatts	64,000
Dependable capacity at site, kilowatts	61,800
Firm energy at site, kilowatt-hour per year	280,000,000

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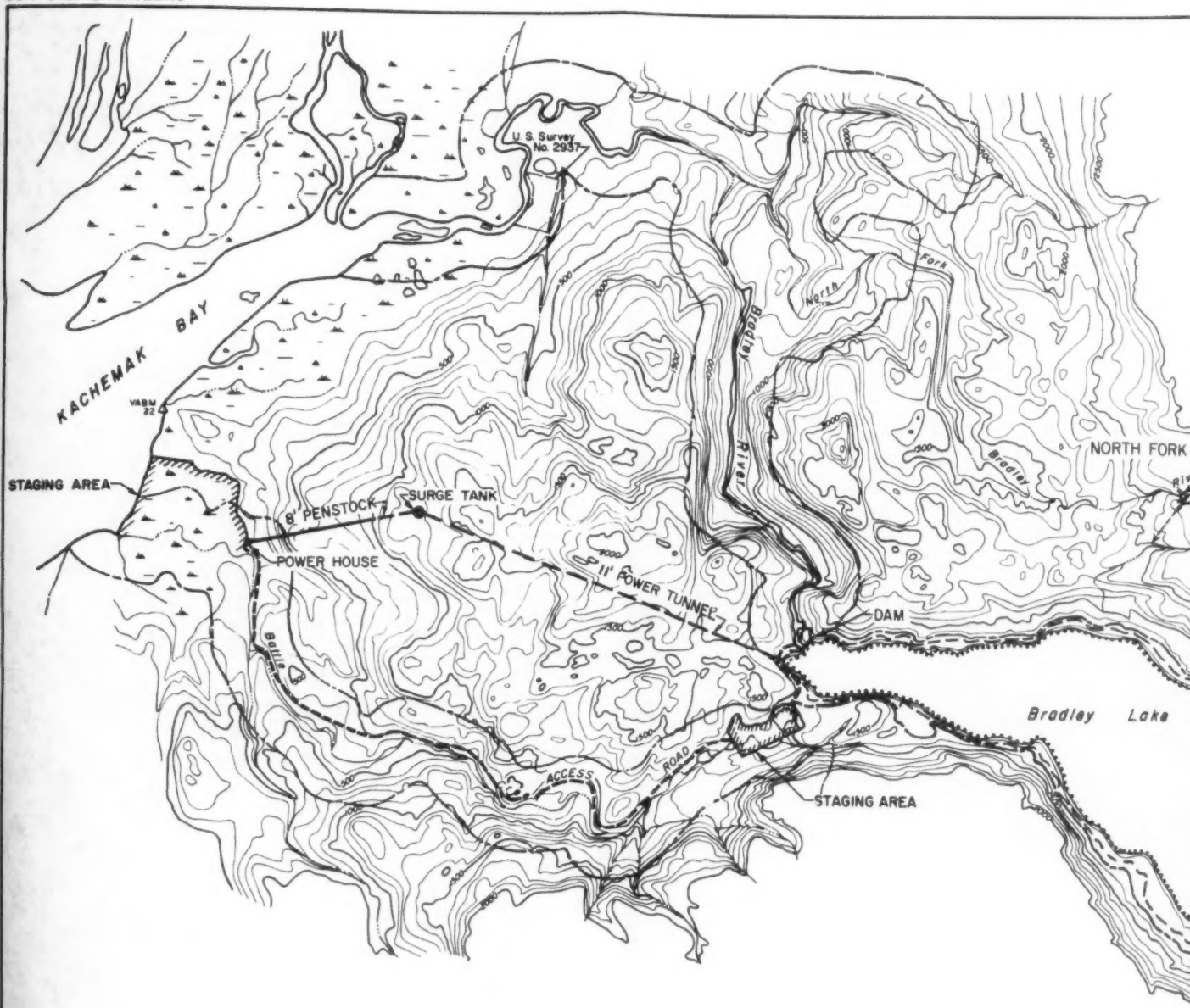
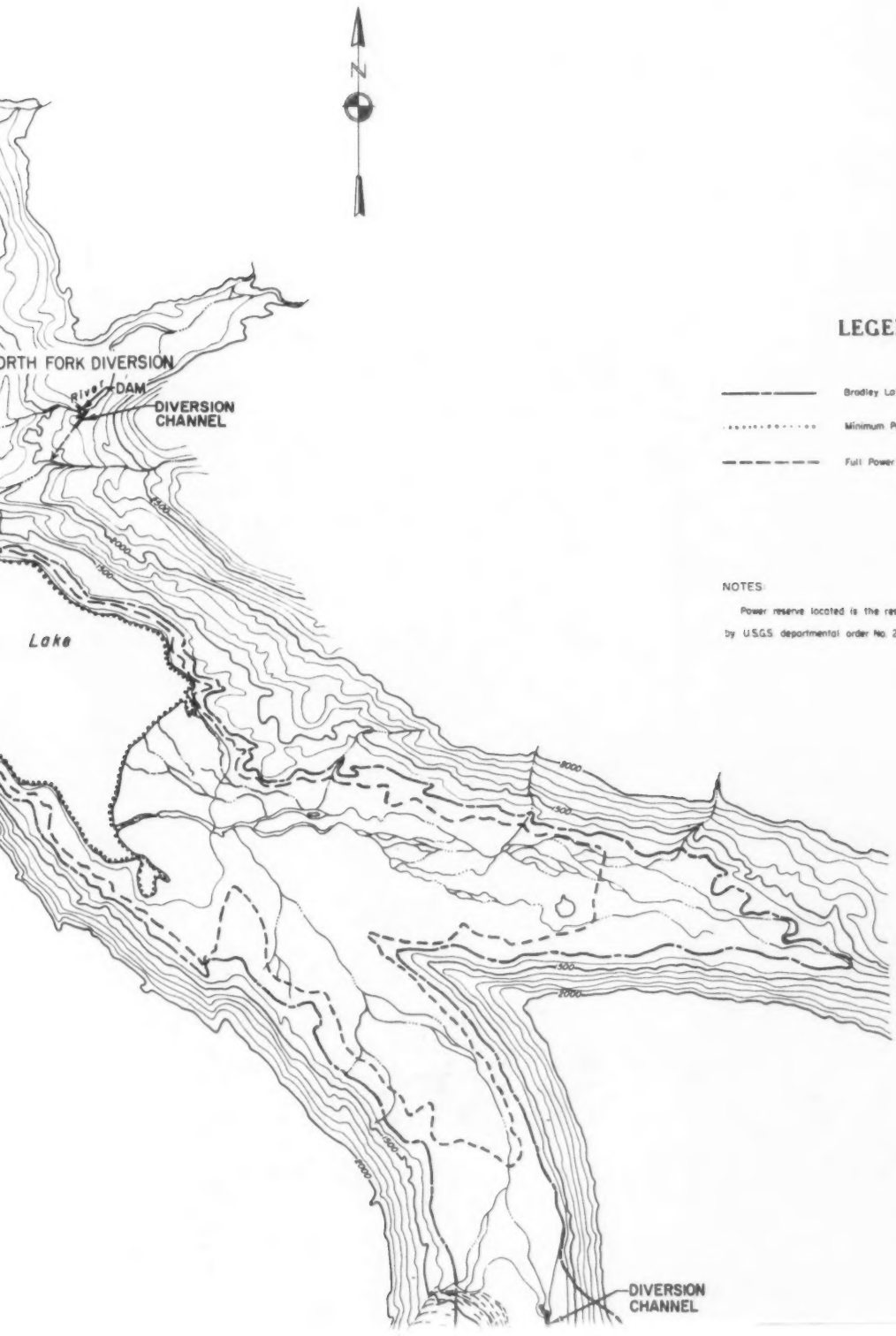

U.S. Survey No. 2937
KACHEMAK BAY
VABM 22
STAGING AREA
8' PENSTOCK
SURGE TANK
POWER HOUSE
11' POWER TUNNEL
Bradley River
North Fork
Bradley
NORTH FORK
DAM
Bradley Lake
ACCESS ROAD
STAGING AREA



LEGEND

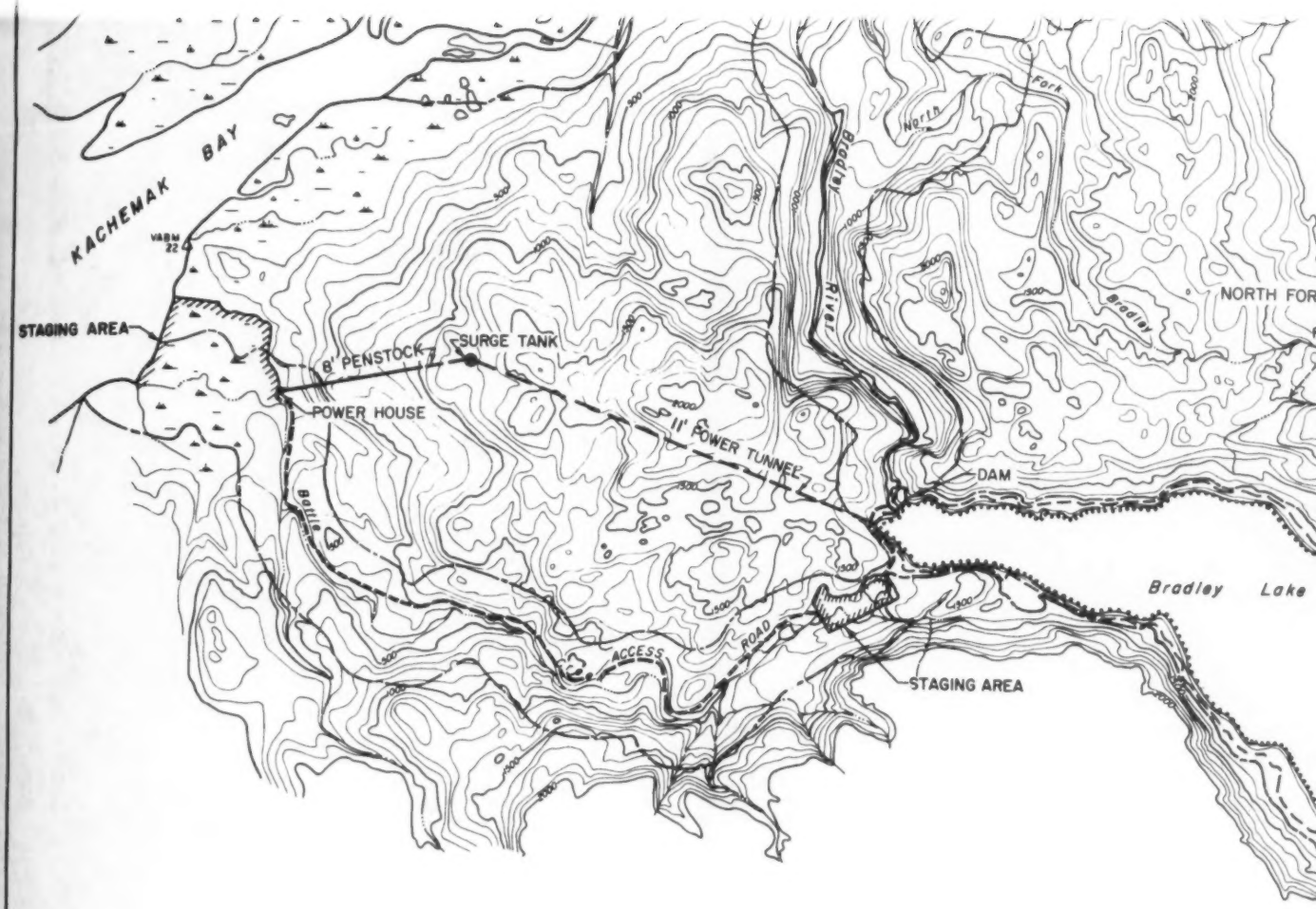
Bradley Lake Power Reserve

Minimum Power Pool Elev 1090'

Full Power Pool Elev 1196

NOTES:

Power reserve located is the result of Power Site Classification No. 436 by U.S.G.S. departmental order No. 2333 dated June 10, 1947.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Bradley River
North Fork
Bradley
NORTH FOR
Bradley Lake
ACCESS ROAD
STAGING AREA
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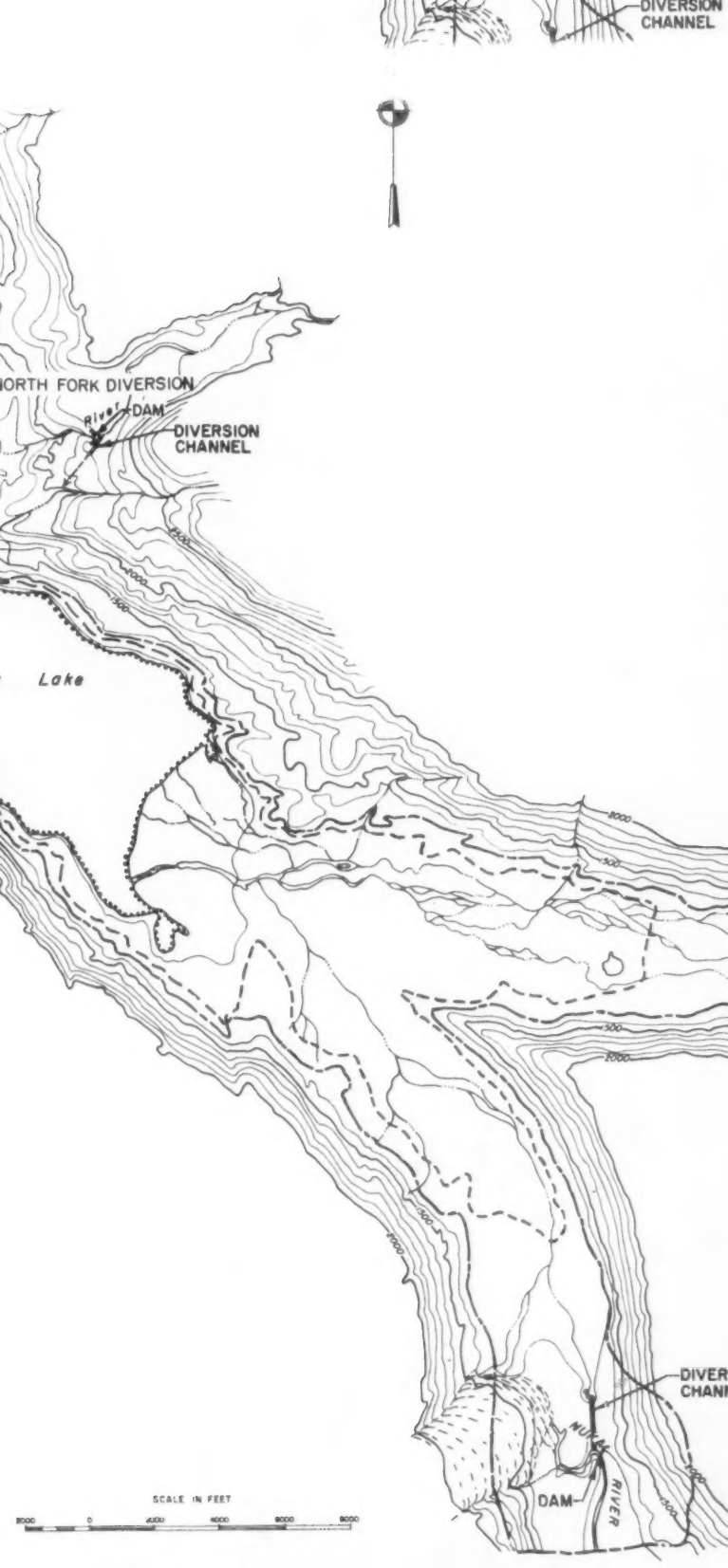

LEGEND

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U. S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: RLH
DRAWN:
TRACED:
CHECKED:
SUBMITTED: RLH
SUBMITTED: Acting Chief, Civil Works Planning Branch
RECOMMENDED: Chief, Engineering Division
APPROVED: Colonel, Corps of Engineers, District Engineer

REVIEW OF INTERIM REPORT NO. 2
COOK INLET AND TRIBUTARIES

PART I
HYDROELECTRIC POWER
BRADLEY LAKE PROJECT

GENERAL PLAN

SCALE: AS SHOWN
DATE: 1 JUN 80
DRAWING NUMBER: Q-19-10-1
SHEET 1 OF 1

PLATE 1

APPENDIX NO. 6

Crater-Long Lakes Division, Snettisham Reclamation Project, Near Juneau, Alaska, Recommended to Congress

[Press release of Bureau of Reclamation, Sept. 25, 1960]

The Bureau of Reclamation's engineering and economic feasibility report on the proposed Crater-Long Lakes division of the Snettisham project, a single-purpose hydroelectric power development to meet present and future needs of Juneau, Alaska, has been forwarded to the Congress, with a recommendation that the project be authorized, the Office of the Secretary of the Interior Fred A. Seaton, announced today.

In the letter transmitting the project report, the conclusion appears that "It is a financially feasible and economically justified project which will be consistent with the policy of the Congress as expressed in the act of August 9, 1955, of encouraging and promoting the development of Alaska."

The report of Commissioner of Reclamation Floyd E. Dominy was accompanied by statements from the State of Alaska and interested Federal agencies.

The Bureau of the Budget expressed no objection to submittal of the report to the Congress, subject to the consideration of the following comment: "You indicate that this project will contribute toward this administration's objective of promoting and encouraging economic development of the resources of Alaska. We believe, however, that under the administration's power policy non-Federal interests should be encouraged to accept responsibility for power development whenever possible. Therefore, we suggest that, prior to authorization of the proposed development, further efforts be made to encourage State or local governmental agencies or business interests to finance and construct the project. However, if construction by non-Federal interests cannot be arranged we would not object to construction of the project by the Department of the Interior."

The propsed water resource project is a single-purpose hydroelectric power development designed to meet growing power requirements for municipal, domestic, and industrial purposes in the Juneau area. It would supply power mainly for industry which is expected to be built in the area very soon. The project presents no opportunity for multi-purpose development of water resources for agriculture, municipal and industrial uses, flood control, or recreation.

It would consist of a three-unit hydropower development with an installed capacity of 48,000 kilowatts capable of generating about 306 million kilowatt-hours of energy annually. The powerplant would be located near the mouth of the Speel River, 28 miles southeast of Juneau. Water would be delivered from nearby Crater Lake, elevation 1,022 feet, and Long Lake, elevation 815 feet, by tunnels and penstocks to the common powerhouse on Speel River.

Power generated at the plant would be delivered to Juneau over 38.7 miles of 115,000-volt transmission line.

Estimated cost of construction of these works, at April 1959 prices, is $38,400,000, all of which would be allocated to power. The total Federal investment of $40 million, including interest during construction, would be repaid with interest in 50 years at rates of 6.1 mills per kilowatt-hour for firm energy, and 4 mills per kilowatt-hour for nonfirm energy.

Estimated annual costs would be exceeded by average annual direct benefits in the ratio of 1.67 to 1.

Reclamation's Eklutna project plant, which went into operation in 1955, currently is the only Federal hydro powerplant in Alaska serving the general public. It supplies nearly 160 million kilowatt-hours of energy annually in the Anchorage area.

A copy of the letter of transmittal to the President of the Senate follows:

SEPTEMBER 22, 1960.

Hon. RICHARD M. NIXON,
President of the Senate,
Washington, D.C.

DEAR MR. PRESIDENT: The attached report on a plan of development for the proposed Crater-Long Lakes division, Snettisham project, Alaska, is transmitted herewith under the provisions of the act of August 9, 1955 (69 Stat. 618).

This proposed project would be a single-purpose hydroelectric power development to serve the present and anticipated future power needs of the city of Juneau, Alaska, and adjacent areas, and of a new industrial development. It is a financially feasible and economically justified project which will be consistent with the policy of the Congress, as expressed in the act of August 9, 1955, of encouraging and promoting the development of Alaska.

The proposed report on this project was transmitted to the State of Alaska and to the interested Federal agencies for review, and copies of the comments which have been received are attached to the report. The report and copies of the comments received were transmitted to the President. A copy of a letter dated September 2, 1960, from the Acting Director of the Bureau of the Budget indicating that the President has no objection to the submission of this report to the Congress is attached.

We recommend that construction of the Crater-Long Lakes division, Snettisham project, Alaska, be authorized as set forth in our report.

Sincerely yours,

ELMER F. BENNETT,
Acting Secretary of the Interior.

[Editorial from Daily Alaska Empire, Oct. 4, 1960]

LET'S START LOOKING NOW

The important hearings held here last month by Senator Ernest Gruening's subcommittee of the Senate Committee on Interior and Insular Affairs have gone a long way toward clarifying the status of the Snettisham project.

After wading through the mountain of testimony given in the hearings it seems apparent that the possibility of the Georgia-Pacific Alaska Co. building its proposed pulpmill near Juneau is extremely remote.

It boils down to a situation of which comes first, the chicken or the egg.

Georgia-Pacific, which, to our knowledge, has been shown every bit of cooperation possible by the State and the U.S. Forest Service, seems to be cooling to the entire project. In fact, the company apparently wasn't even interested enough to send a representative from its headquarters to the subcommittee hearings. It thought a letter was good enough.

Georgia-Pacific has made it clear that a large quantity of power has to be available, or at least assured, before it will make a move on the proposed mill. This, of course, seems resonable enough. No one expects the company to risk such a major investment without firm assurance that the proposed hydroelectric project will be built.

On the other hand, the economic feasibility of the Crater-Long Lake division of the Snettisham project is dependent on the established need of a large industrial power user in the Juneau area. It is doubtful that Congress would approve a $38 million investment that could—if one company changes its mind—become almost a white elephant until Juneau eventually develops to the point where it has a need for such a vast power supply.

Attempting to meet the company more than halfway, however, the Bureau of Reclamation has gone ahead anyway and recommended the project favorably to Congress.

It is to be hoped now that Georgia-Pacific will demonstrate more clearly its intentions.

The company received the preliminary award of a 50-year contract of sale for 7½ billion board feet of the nearby national forest timber on August 17, 1955. There followed a long series of delays and again on June 27, 1958, Georgia-Pacific received a 3-year extension on the preliminary award. This runs out before July 1 next year.

Just how much more stalling on the company's part the State and the Department of the Interior are going to accept is anybody's guess.

For our part, it would seem that Alaska has rocked along far enough with Georgia-Pacific. The State government owes it to the people of southeast Alaska to provide the initiative to seek out other prospective pulpmill developers. Unless this is done, we are going to roll along until next July and find ourselves without any Georgia-Pacific or anyone else on the hook. Will it then be another 3 years before we move toward bringing a new industry to Juneau?

Let's start looking now.

APPENDIX NO. 7

Snettisham Iron Ore Deposits

A. Excerpt From "Studies of the Snettisham Magnetite Deposit, Southeastern Alaska," Bureau of Mines Report of Investigations 5195, February 1956

SUMMARY

The Snettisham Peninsula, 30 miles southeast of Juneau, Alaska, was studied by the Bureau of Mines to obtain basic information about the size, grade, and metallurgical characteristics of a large basic intrusive containing titaniferous magnetite. The investigation, which was part of a continuing program to determine the potential reserves of iron and titanium ores in Alaska, included transit and magnetometer surveys, followed by diamond core drilling and metallurgical testing.

The magnetic attraction of a part of the Snettisham Peninsula is noted on early navigational charts prepared by the Coast and Geodetic Survey. Reconnaissance examinations by the Geological Survey and a preliminary dip needle survey by the territorial department of mines indicated the general nature of the basic intrusive, but little was known as to the grade and extent of the magnetite mineralization. The detailed survey by the Bureau of Mines proved an area of approximately 390 acres in which generally high magnetic anomalies with exceptionally high localized anomalies occur. Subsequent drilling across a representative section of the deposit yielded core samples, which assayed from 11 percent to over 45 percent total iron. A large sample of core composited to represent the drilled portion of the deposit assayed 18.9 percent Fe, 2.6 percent TiO_2, and 0.29 percent S, 0.32 percent P, and 0.05 percent V.

Representative samples composited from drill cores were subjected to beneficiation tests at the Juneau laboratory. Direct magnetic separation of ore ground to minus 150 mesh or staged magnetic separation of 35-mesh ore with concentrates retreated at minus 150 mesh resulted in the recovery of 61 to 64 percent of the total iron in a concentrate assaying about 64 percent iron, 3.5 percent TiO_2, 0.3 percent V, 0.4 percent S, and less than 0.01 percent P. The sulfur content of the concentrate could not be lowered by mechanical methods but was satisfactorily reduced by sintering.

The work by the Bureau of Mines indicated a favorably situated, potentially large deposit containing titaniferous magnetite that can be recovered as a high-grade magnetite concentrate, using standard, comparatively low-cost methods of beneficiation.

INTRODUCTION

The rapid depletion of domestic reserves of high-grade iron ore, advances in methods of concentrating lower grade ore, and the continued expansion of heavy industry along the Pacific coast are factors in directing increased attention to the possibility of utilizing Alaska deposits of iron as sources of supply for local or western industries. The titaniferous magnetite deposits of southeastern Alaska are of particular interest because of their large size and accessibility and also because of the favorable natural conditions that prevail in the coastal region in which the deposits are situated.

To stimulate interest in the deposits and to provide basic information for possible commercial development the Bureau of Mines has conducted preliminary investigations of the Klukwan deposit near Haines, Alaska, and of the Snettisham deposit near Juneau, Alaska. The results of laboratory beneficiation tests on Klukwan ores have been published;[1] factual data resulting from field and laboratory investigations of the Snettisham deposit are presented in this report.

LOCATION AND ACCESSIBILITY

The Snettisham deposit is on the mainland in the southern part of the Juneau mining district 30 miles southeast of Juneau, Alaska. The deposit is within Alaska District Survey 160 at latitude 57°59′ N. and longitude 133°46′ W. (figs. 1 and 2). The magnetite-bearing material extends from approximately 1,000 feet southwest of Sentinel Point for 2 miles along the southeastern shoreline of Port Snettisham.

[1] Wells, R. R., and Thorne, R. L., "Concentration of Klukwan Alaska Magnetite Ore." Bureau of Mines Report of Investigations 4984, 1953, 15 pp.

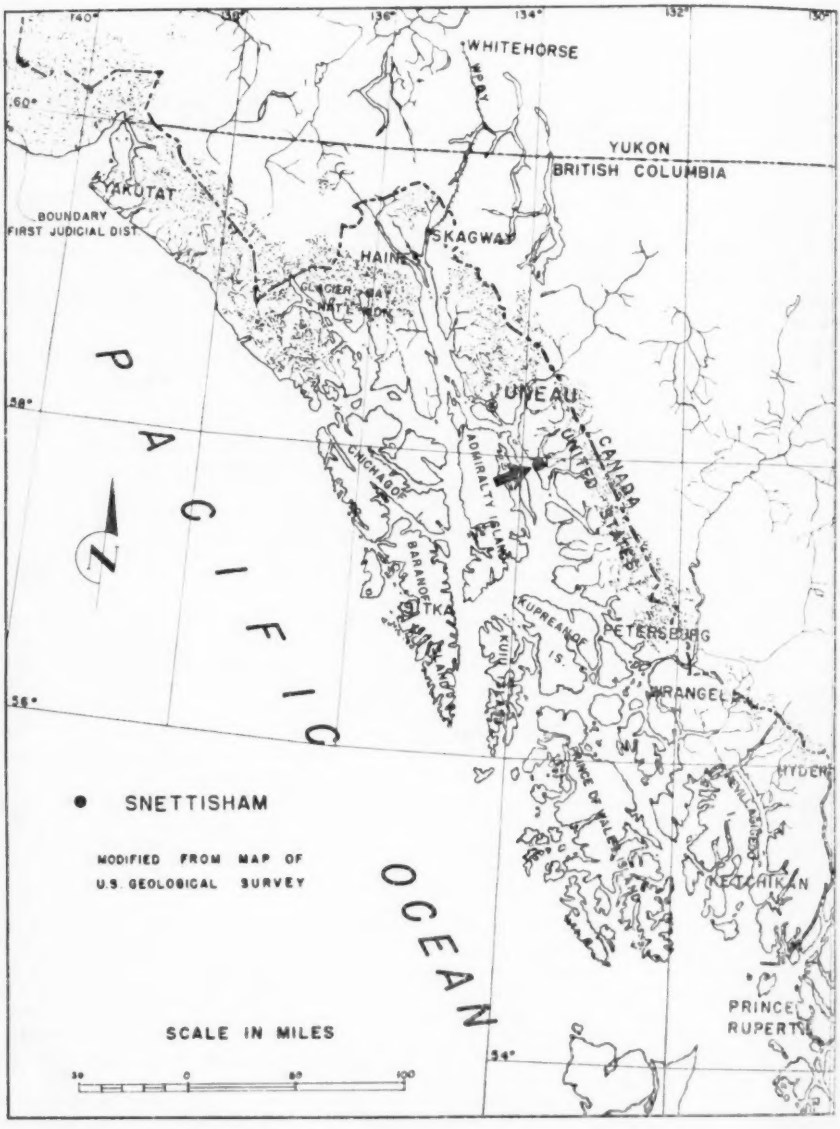

FIGURE 1.—Index map Southeastern Alaska.

Port Snettisham is part of a deep, semiprotected system of inland waterways that permit year-round shipping along the southeastern Alaskan and Canadian coasts. The construction of a short dock at the property would provide direct access for oceangoing vessels; year-round barge transportation along the inland waterways has proved feasible. Present access is by small boat or pontoon-equipped plane, which may be chartered in Juneau.

PHYSICAL FEATURES AND CLIMATE

The magnetiferous deposit is near the northern end of Snettisham Peninsula, a ridge 2,500 to 3,000 feet high, 15 miles long, and about 4 miles wide. The topography and general geology of the magnetite-bearing area are illustrated by figure 3.

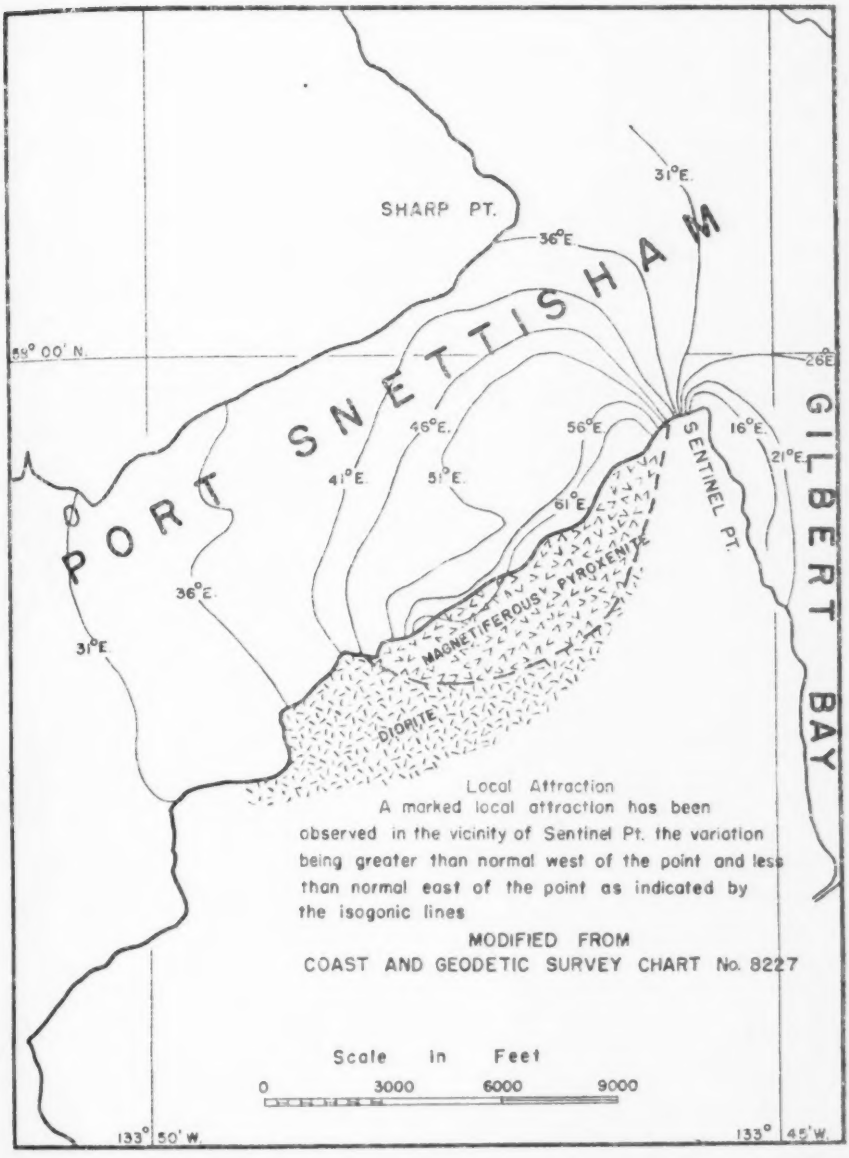

FIGURE 2.—Magnetic variation in Port Snettisham.

Most of the terrain overlying the deposit is steep and precipitous, but at the western edge a portion of it is a hilly lowland that was the site of the once-active town of Snettisham. The shoreline is abrupt and rocky but there are several places where docks have been successfully established in the past.

Dense evergreen vegetation covers the area from the shoreline to an altitude of 2,000 feet. In some logged-off and swampy areas scrub and second-growth timber grow profusely, but virgin spruce and hemlock predominate. Berry bushes, devils club, and other vegetation cover all rock exposures except on the steepest slopes.

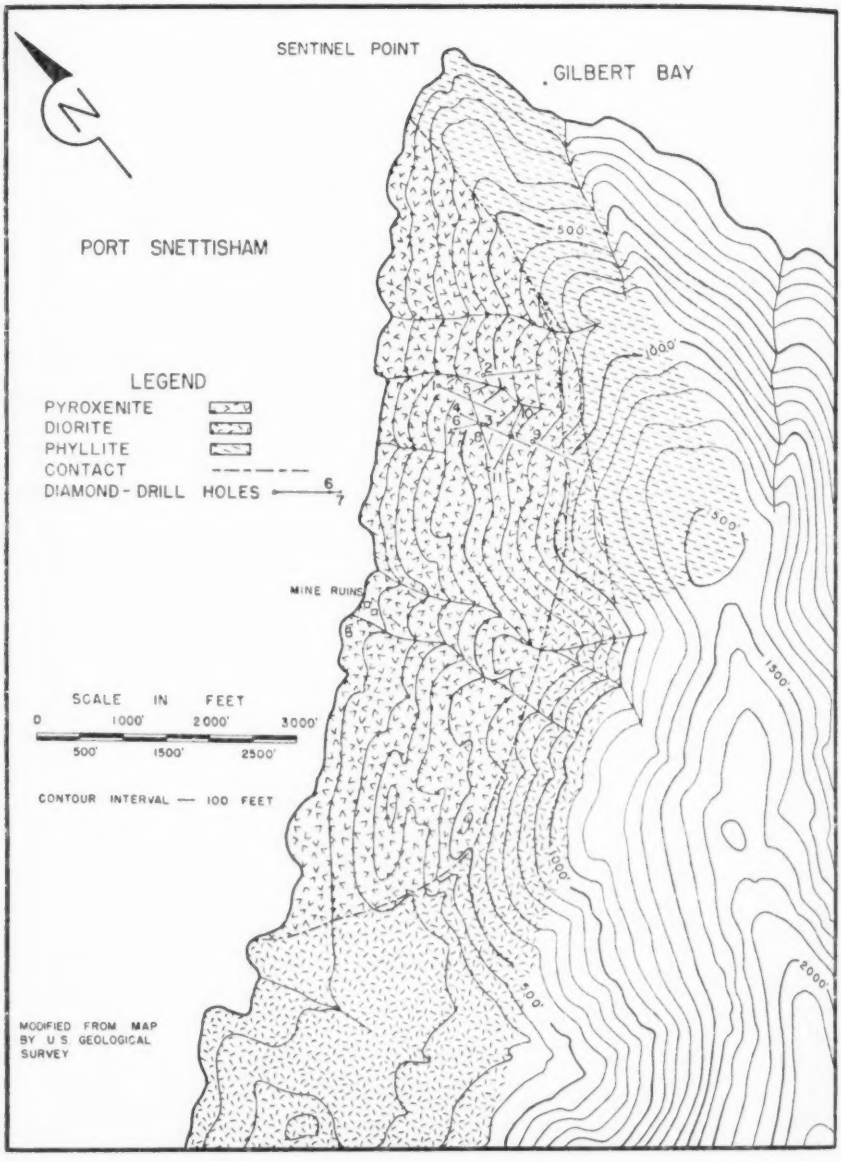

FIGURE 3.—Topographic and geologic map.

The potential of nearby hydroelectric power sites has been calculated from accurate measurements to be at least 65,400 primary horsepower. The estimate is based on the flow from the watersheds of Crater, Long, and Sweetheart Lakes only; it does not consider the power potential of either the Speel or the Whiting Rivers.

The climate is temperate but wet. The nearest weather recording stations are at Juneau and at Five Finger Light, which are equidistant to the north and south, respectively. In 1949 the mean annual temperature of Juneau was 41.3° F.; the mean annual precipitation was 99.29 inches. Corresponding records at Five Finger Light were 42.9° and 70.2 inches. Records kept for 7 years at Speel River, approximately 5 miles north of the iron deposit, show an average annual precipitation of 143.33 inches.

LABOR AND LIVING CONDITIONS

The Snettisham Peninsula is a primitive and undeveloped area. The necessary prerequisites for good living conditions are present, however, in the ready access to waterpower potential, good drinking water, abundant timber, and a good townsite. At present only one permanent resident lives on the Snettisham Peninsula; all labor would have to be brought to the area. The type of labor required for open-pit mining is similar to that required for road construction in mountainous areas; a roving group of men skilled in such work is available in Alaska.

HISTORY AND OWNERSHIP

Snettisham was an active gold-mining camp near the turn of the century. The Crystal and Friday mines were operated by the Alaska Snettisham Gold Mining Co. from 1899 through 1905. The company had 21 lode and millsite claims surveyed for patent, with improvements valued at $26,100. The records, however, indicate that there was no application for patent. Sporadic gold mining was continued in the area until the early 1930's.

Evidence has existed for some time as to the probability of the presence of a large magnetite-bearing ore body in the Snettisham area. A. F. Buddington [2] and Theodore Chapin [3] described masses of hornblende and hornblende-pyroxenite with accessory magnetite, apatite, and plagioclase on the northern end of the Snettisham Peninsula; they also mention "a 6-foot vein of practically solid titaniferous magnetite" near the post office at Snettisham. In 1918 an open cut was made on this vein, and 4 or 5 tons of ore was shipped to the Treadwell mines at Douglas, Alaska. The material is reported to have carried 4 or 5 percent titanium.

N. H. Heck [4] of the U.S. Coast and Geodetic Survey reported that a crew working with the steamer *Explorer* mapped the magnetic lines in the vicinity of the Snettisham Peninsula. The study revealed a magnetic disturbance throughout an area of 20 square miles of land and water and an intense magnetic disturbance throughout an area of 8 square miles. This information later was incorporated in U.S. Geodetic Survey Chart 8227; it is shown as figure 2.

Mineral Survey 2188 (fig. 4) shows the mining claims in the area covered by this investigation. The first eight claims of the Magnetite group were located by Robert E. Coughlin and W.S. Pekovich in August 1950; they extended along the east shore of Port Snettisham from 600 feet south to 3,600 feet south of Sentinel Point. The number of claims was increased to 18 in 1953.

DESCRIPTION OF THE DEPOSIT

General geology

The northern part of Snettisham Peninsula is composed of diorite and pyroxenite, which has been intruded into phyllite. Near the abandoned mining town of Snettisham, pyroxenite is exposed along the beach and extends inland for a considerable distance (fig. 3). To the east, toward Sentinel Point, the pyroxenite is in contact with the phyllite, into which some sill-like layers of pyroxenite have been injected. To the south the pyroxenite is in gradational contact with diorite, as is indicated by float, by change in magnetic attraction, and by drill hole 9, which penetrated the contact zone (figs. 7, 8, and 15); outcrops are infrequent because of the heavy cover of soil and vegetation.

The pyroxenite is intruded by dikes of diorite and aplite and, more rarely, by narrow vein dikes of white alkali-calcic plagioclase. Aerial photographs of the Port Snettisham area indicate that the regional topography has been influenced greatly by a series of major fractures, which trend N. 15° W. and are intersected by another series of approximately parallel fractures trending N. 45° E. Within the area underlain by pyroxenite no major faulting is indicated by the topography; furthermore, no large fractures were encountered in the drill holes, although some movement within the intrusive is indicated by flow structure exhibited in the drill core.

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[2] Buddington, A. F., "Investigations in Southeastern Alaska," Geologic Survey Bulletin 773, 1923, pp. 133–134.

[3] Buddington, A. F., and Chapin, Theodore, "Geology and Mineral Deposits of Southeastern Alaska," Geologic Survey Bulletin 800, 1929, pp. 197–198.

[4] Heck, N. H., "Where the Compass Fails To Guide," Scientific American, March 1923, p. 192.

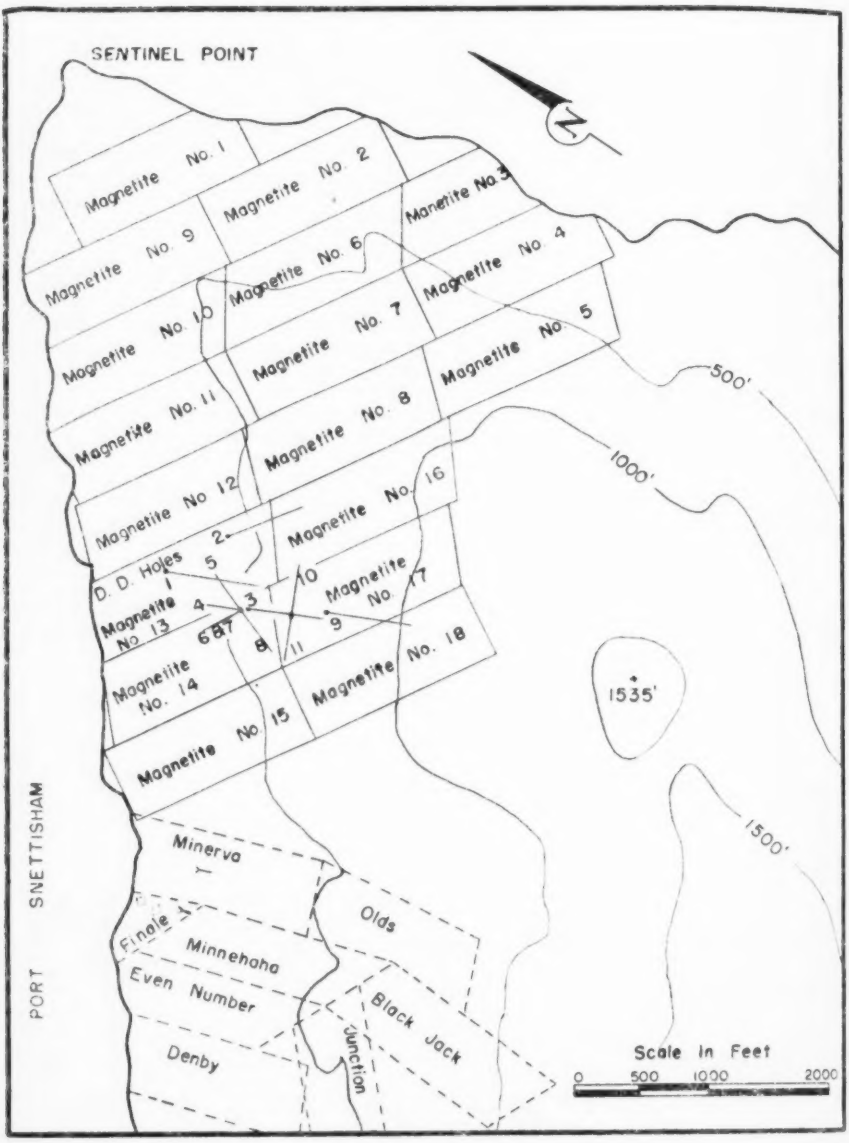

FIGURE 4.—Sketch map of Snettisham claims.

Character and size

The northwestern part of the intrusive mass is composed of pyroxenite and associated variants containing magnetite, which occurs generally disseminated but also in localized concentrations. The remainder of the intrusive is diorite, which also contains magnetite but in considerably smaller percentages than does the pyroxenite. Hornblende is a major constituent of the pyroxenite; in parts of the deposit it is the dominant dark mineral.

Extreme variation in texture characterizes the pyroxenite deposit. Coarse-grained pegmatitic phases occur within the mass; they may consist of pyroxene and/or hornblende or pyroxene, hornblende biotite, and magnetite in varying proportions, including dominant magnetite. Occasionally chlorite is intergrown

with the other minerals. The magnetite commonly is associated with sphene, apatite, epidote, and very small amounts of pyrrhotite, chalcopyrite, ilmenite, and spinel.

As mentioned above, the magnetite is disseminated generally throughout the pyroxenite mass in fairly uniform amounts, but higher grade concentrations are indicated by float, by occasional outcrops, and by core-drill samples. Buddington[5] mentions a 6-foot vein of virtually solid ilmenitic magnetic outcropping on the beach about 100 yards east of the first point opopsite the site of the post office building at the old Snettisham mine camp. This cropping could not be identified during the Bureau of Mines investigation; however, massive magnetite float is abundant in the vicinity of the old camp, and a small cropping north of the location mentioned by Buddington yielded samples that assayed 43-percent total iron. Massive magnetite is exposed in the bed of the small stream flowing between diamond-drill holes 1 and 2 (fig. 3) at approximately 600 feet altitude. Drill holes, 1, 2, 4, 6, and 7 all encountered massive magnetite or above-average, magnetite-enriched pyroxenite in core sections ranging from 2 feet to over 50 feet in length. The size, continuity, and manner of occurrence of the high-grade magnetite encountered in the drill holes were not determined, but the incidence of such occurrence is believed to be normal for the drilled section of the pyroxenite intrusive.

The magnetite-bearing pyroxenite intrusive occupies a land area of approximately 390 acres along the northeast shore of Snettisham Peninsula, as shown in figure 3. The shape of the exposed portion of the deposit is roughly that of the segment of a circle, with the chord length along the shore approximating 9,600 feet. The widest west-east section is approximately 2,400 feet; altitudes range from sea level to 1,000 feet. The pyroxenite extends northwestward under the waters of Snettisham Inlet for an unknown distance.

B. Letter from Owen Ore Co.

OWEN ORE CO.,
Duluty, Minn., September 28, 1960.

Re statement of power requirements—Port Snettisham development, Alaska.

Hon. ERNEST GRUENING,
Senate Office Building,
Washington, D.C.

DEAR SENATOR GRUENING: The Port Snettisham iron ore deposit is well described in the Bureau of Mines report of investigation, No. 5195. It is a very large low-grade iron ore deposit on the Snettisham Peninsula, 30 miles southeast of Juneau, Alaska.

The magnetite-bearing material extends from Sentinel Point along the height of land for perhaps a mile, thence westerly to tidewater. It roughly covers the western slope of the Snettisham Peninsula within the above limitations.

Concentration tests on iron-bearing materials here found were run both by the Bureau of Mines and ourselves. The material concentrates very well. The process required is not dissimilar to that used on the Minnesota taconite.

For a 3-million-ton-per-year (finished product) operation, producing high-grade pellets for blast furnace feed, there would be required power facilities of 40,000-kilowatt capacity.

Because the concentrates carry from 2 to 3 percent TiO_2, which element presents some obstacle for blast furnace use, a direct reduction process to produce pig iron or a high iron substitute by a process using electrical smelting equipment, would require approximately 200,000 kilowatts.

Conferences with Japanese representatives of Japanese steel companies have been held. They are very much interested in a supply of pellets but consider the TiO_2 content somewhat excessive.

A supply of pig iron for the west coast steel industry in the United States would seem to present a reasonable outlet for the product of an electrically smelted iron ore at Snettisham. Obviously, such a process would not be economical without very low-cost power.

The supply of iron ore in western United States is not large. Such deposits as there are are widely scattered. An expanding west coast steel industry would be greatly enhanced by an assured supply of raw materials of substantial proportions.

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[5] Work cited in footnote 2.

The Port Snettisham iron ore deposit is covered by two groups of claims, 18 held by Sam Pekovich of Juneau and 43 held by Owen Ore Co. of Duluth, Minn. The claims are not fully explored but the Bureau of Mines has put down a sufficient number of drill holes to indicate a deposit of some seven or eight hundred million tons of crude ore, which would concentrate to something in excess of a hundred million tons of high-grade iron ore concentrates.

An electrical smelting process would seem to be an ideal method of extracting commercial quantities of iron from this large deposit, because in such a process the TiO_2 is entirely eliminated.

Because the deposit borders protected waters offering an excellent harbor, the mining chance and shipping facilities are ideal. The harbors are open the year around and weather conditions are such as to permit open pit operations throughout the year.

Very truly yours,

OWEN ORE CO.,
WARREN S. MOORE.

APPENDIX NO. 8

The Economic Impact of Federal Development of Multipurpose Water Projects in the Pacific Northwest

Power.—Low-cost hydroelectric power produced at Federal projects and distributed at "postage stamp" rates has been a major element in economic expansion of the Northwest. Recently Northwest Economist Ivan Bloch noted that:

"Economic activity has been traditionally oriented to the rendition of the area's natural resources and continues to do so with market emphasis on increasing manufacturing to high unit-value products * * *. However, it was the large-scale development of waterpower, which gained impetus in the early 1930's with the construction of major Federal dams, which brought in new types of industrial and economic production units. Pacific Northwest aluminum, ferroalloys, phosphorus, and an imposing number of other electrometallurgical and electrochemical products owe their existence predominantly to the great quantities of very low-cost Columbia River hydroelectric power transmitted to al points of the Pacific Northwest by means of a high capacity transmission network."

The growth of electric loads in the Northwest for the period 1934–55 reflects the economic impact of construction of Federal projects.

Electrical energy requirements in the Northwest increased over 10 times between 1934 and 1955, almost double the increase experienced in the Nation as a whole. With the end of World War II, a cutback in manufacturing activities caused industrial power consumption to drop. However, use of residential and commercial energy continued to increase, and the drop in industrial load proved temporary. As industry converted to peacetime production, new electrometallurgical plants and ancillary industries entered the area, and new irrigation projects came into being. The result was a revitalization of the region's economy and total electrical energy requirements rose rapidly.

The Corps of Engineers declared of the period 1934–55 in its 1958 "308 Review Report" on the Columbia River Basin that:

"The rapid increase in the area's power requirements during this period was brought about by a number of events, including the following: the construction by the Federal Government of hydroelectric plants on the Columbia River and the availability of large blocks of low-cost electric power; World War II and the Korean conflict with the associated heavy demands for industrial power; large irrigation developments; the population increase brought about mainly by the industrial labor demand; and continuous economic prosperity at high levels."

The corps reported that the rapid increase in electrical energy requirements was reflected within each classification of use. For the major classes, the requirements increased in the 1934–55 period as follows: combined rural and residential, 15 times; irrigation (highlighted by the start of Grand Coulee pumping in 1951), 27 times; commercial requirements, 7 times; and industrial use, 15 times.

Prior to 1940, the Northwest economy was based mainly on exploitation of natural resources produced by its farms, mines, and forests. Since that time

a significant change has taken place. As the corps reported in 1958. "The transition occurred owing to the war-created metallurgical, chemical, shipbuilding, aircraft, and related activities. The large hydroelectric power projects which were built during this period ushered in an era in which a special type of industrialization developed—one dependent almost wholly on an abundance of relatively low-cost power."

The transition offered greatly expanded employment opportunity, and from 1940 to 1950 the population of the region increased annually at a rate better than double that for the Nation. The influx through interstate migration accounted for 34 percent of the population increase. Per capita income rose from $466 in 1935 to $1,596 in 1950. In 1940, about 15 percent of the region's labor force was unemployed. During the early 1940's, the labor force expanded rapidly and unemployment to 1955 was low except for a slump immediately following the end of World War II.

Over 90 percent of the Northwest's installed electric capacity is hydro. As of June 30, 1959, the U.S. Columbia River power system had a generator installation of 5,721,250 kilowatts of nameplate rating at 13 hydroelectric plants. The system generated 30.3 billion kilowatt-hours of energy during the year ending on that date. This represented 62.5 percent of the generation by the major utilities located in the area served by BPA.

The BPA transmission system at the end of fiscal year 1959 consisted of 7,936 circuit miles of transmission lines and 193 substations having an installed transformer capacity of 14,005,000 kilovolt-amperes. The BPA transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest.

Attached are tables showing Federal investment in multiple-purpose projects and transmission facilities; detail by type of facility; and amount of repayment of power capital investment.

Discussion of the economic impact of low-cost power generated at Federal projects on the Columbia River system may be separated into five categories by type of customer: (1) farm customers, (2) nonfarm residential customers, (3) irrigation pumping, (4) commercial customers, and (5) industrial customers.

Between 1935 and 1955, the Northwest's population increased from about 3,124,000 to 4,841,000—about 55 percent. During this same period the number of rural and residential customers increased from 556,870 to 1,442,771—almost 160 percent.

In 1935, estimated average annual use of electricity per farm customer in the Northwest was 1,410 kilowatt-hours. In 1955, the figure was 8,299 kilowatt-hours. Abundant low-cost Federal power coupled with REA-financing of distribution facilities also accounted for a greater percentage of farms receiving electricity. While the number of farms declined, the number of "electric" farms increased.

The effect of Federal power development in the Northwest is illustrated by comparison with farms in the eastern half of the United States where in 1935 average annual use per farm customer was 873 kilowatt-hours and in 1955 had increased to only 3,650 kilowatt-hours. Thus, while use in the East was 62 percent that of the West in 1935, it was only 44 percent in 1955.

Extension of distribution and increased usage has raised the standard of living of farm families and resulted in vast expansion of the rural market for appliances which employ electricity for cooking, water heating, space heating, automatic washers, clothes dryers, plus milling, grinding feed, hay drying, soil heating, and space heating of barns and sheds. Appliance sales firms in the Northwest have benefited accordingly.

Average annual use per nonfarm residential customer in the Pacific Northwest in 1955 was 7,100 kilowatt-hours—525 percent above 1935, and over 2½ times greater than the average national use.

While in 1935, the average use per residential customer in the Pacific Northwest was less than double that of the national average and, although the U.S. average has increased rapidly, in 1955 the Pacific Northwest average was 2.6 times the average use for the United States as a whole.

Again, availability of low-cost Federal hydropower was the major factor in creating increased usage. In 1940, average residential rate for the United States was 3.84 cents per kilowatt-hour; in the Pacific Northwest the average rate was 2.33. In 1955, the figure for the United States was 2.64 cents; in the Northwest it was 1.28 cents.

And again, as in the case of rural residents, increased usage opened enormous markets for electric appliances.

In 1950, the first year irrigation use was reported in Federal Power Commission form as a separate category, total energy use was 242 million kilowatt-hours. With the start of Grand Coulee pumping in 1951, irrigation requirements doubled in 1 year.

In the years following 1951, increases in irrigation pumping in the Northwest resulted in large increases in energy use. By 1955, the figure was 1,225 million kilowatt-hours. Pumping at Federal projects in the Pacific Northwest accounted for 60 percent of irrigation energy requirements in that year.

Increased irrigation has had a direct effect on the market for pumping equipment, sprinklers, irrigation pipe, and farm supplies normally associated with agciultural production on irrigated lands in this region of the country.

Sales to commercial customers during the 20 years 1935 to 1955 increased from 579 million kilowatt-hours to over 4 billion kilowatt-hours—almost seven times. The number of commercial customers in the Northwest doubled during this period, increasing much more rapidly than the population. Commercial use per customer increased almost 200 percent between 1935 and 1955.

While the requirements of the average commercial customer for the Nation have increased over 2.5 times since 1940, in the Northwest the average has increased about 2.9 times. In 1940, the average annual use per customer in the Northwest was 44 percent higher than that of the Nation; in 1955, the average was 63 percent higher.

Both increase in the number of commercial customers and their use of electricity is reflective, directly and indirectly, of the "electric consciousness" which exists in the Northwest.

Industrial energy sales in 1940 amounted to about 42 percent of total utility load. With the rapid expansion of war industries during World War II, the importance of this classification increased and by 1944 accounted for almost 60 percent of utility requirements. A decline was experienced after the end of the war, but industrial sales still demand about 50 percent of total energy developed in the area.

Between 1934 and 1940, the average annual rate of increase in energy requirements for industry was 12.6 percent. From 1940, when the area's first large Federal hydroelectric projects came into full operation, through 1944, the annual rate of growth averaged 26.5 percent. After a sharp postwar dip, requirements began to increase and from 1947 to 1955 the annual average rate was 10.6 percent.

In fiscal year 1959, industrial customers accounted for 39.47 percent of BPA's revenue dollar. The aluminum industry provided 24.44 percent and other industries 15.03 percent. BPA served 19 industrial customers throughout the Northwest and supplied power to public and private utilities who service other industries.

Low-cost Federal electric power has attracted to the Northwest a number of industries which require large quantities of electric power to produce their product and which regard the price of electricity as a major factor in product cost. These industries include aluminum, chlorine, and caustic soda, calcium carbide, ferro alloys, phosphorous, titanium, zirconium, magnesium, and silumin.

Establishment and expension of the aluminum industry in the Pacific Northwest is an example of the power of low-cost Federal power to create economic expansion.

The first aluminum plant in the Northwest was the Alcoa plant at Vancouver, Wash., which went into operation in 1940. Reynolds Metals Co. located a plant at Longview, Wash., which began production in 1941. Government-owned plants were constructed at Troutdale, Oreg., and Spokane and Tacoma, Wash., in 1942.

These plants were all located in the Northwest because large quantities of low-cost power were available, as a result of Federal development, to produce the increasing amount of aluminum needed for the defense effort.

After the war, the Government plants at Tacoma and Spokane were purchased by Kaiser Aluminum & Chemical Corp. Reynolds bought the Troutdale plant.

In 1940, the Northwest had no aluminum production capacity. In 1950, as a direct result of availability of low-cost power, it had 44 percent of the entire national aluminum production capacity.

In addition to electroprocess industries, low-cost electric power has provided a competitive catalyst for expansion of traditional industries based upon Northwest natural resources including minerals such as zinc, lead, and copper, and forest products.

The attraction power of low-cost Federal hydroelectric power was dramatically illustrated earlier this year when the Bonneville Power Administration announced availability to industry of a block of more than 300,000 kilowatts of

firm and secondary power. The power was snapped up at once, and more requests for power were received than could be granted. Allocation of the available power will provide for establishment of two new electroprocess industries in the Pacific Northwest and plant additions for two existing industries. Investment in new plant facilities alone is expected to approximate $140 million. Long-term contracts for sale of the power to the four industries will increase BPA revenues by approximately $6,500,000 annually. Industrial expansion will include:

Construction of a steel mill at Anaconda, Mont., to reclaim copper and zinc and produce about 350,000 tons of steel annually from slag.

Construction of two aluminum potlines at a site near Longview with a possibility of some processing locally.

Construction of two additional potlines at a location yet to be determined.

Modification of a pulp processing plant at Port Townsend, Wash.

Navigation.—Modern barge navigation on the Columbia River above Vancouver, Wash., began in 1938 when the Bonneville ship lock was placed in operation. The dam created a slack waterway extending limited deep-draft navigation to The Dalles, a total distance inland of 188 miles from the Pacific Ocean.

"The effect of this improvement was well-nigh instantaneous: The volume and diversity of tonnages, up and downstream, bounded upward sharply, and continued to do so year after year," according to Ivan Block, private consultant who has done economic-industrial analysis work in the Pacific Northwest for the past 20 years.

In 1938, barge traffic through Bonneville lock amounted to 161,920 tons. In 1956, traffic totaled 1,518,924 tons and reached farther inland because of the addition of new Federal navigation facilities. (See charts of statistics on Federal investment in navigation on the upper Columbia River.)

Growth of shoreside commerce accompanied the extension of navigation. By mid-1959, there were 36 organized port districts to serve the Columbia-Snake River waterway. The assessed valuation of these port districts was close to $3 billion.

Grain and petroleum products are the principal items of present commerce. In 1958, grain elevators on the Columbia River above Bonneville had a total capacity in excess of 25 million bushels and could tranship several times that amount each year. Additional elevators are planned for construction at four new locations bordering the John Day Pool. Petroleum tank farm storage of 58 million gallons was located along the McNary Pool alone in 1958.

Most of the barge cargo carried on the upper Columbia is transhipped to or from deep-draft vessels at the ports of Portland and Vancouver. Both have become established as important deepwater harbors.

The Columbia River accounts for approximately 12.5 percent of the total west coast oceanborne commerce. This percentage has been steadily increasing over the years. (In 1953, the Columbia River contribution was 918 percent.) In 1958, in terms of foreign outbound ocean commerce, the Columbia River substantially topped all other coastal ports, a record attributable to the very large export of wheat and grain (50 percent of total outbound tonnages). Petroleum products constituted the major inbound tonnages handled (93 percent).

The volume of river traffic has resulted in a substantial investment in facilities for handling of maritime cargoes in the Portland-Vancouver area. For instance, it is estimated that the shipbuilding and ship repair industry alone, in the Portland area, ranges from $15 to $20 million annually. A new drydock to be built beginning in 1961 by the Port of Portland Commission is expected to increase the annual value of that industry by as much as 50 percent in the near future.

Ivan Bloch reports that: "Estimates have been made from time to time as to the total value accruing to the lower Columbia River of its maritime and river commerce. These include the direct employment of over 5,000 longshoremen, seamen from ships entering the area, the major shipbuilding and repair activity, the sums expended for normal voyage maintenance repairs and for ship stores. In 1958, it can be estimated that this value exceeded $40 million. These estimates did not include the value accruing from enterprises which encompass stevedoring, ship chandlers, freight forwarders and warehousers, customs brokers, banks and insurance companies, and those which are engaging in towing, lighterage and refueling of vessels, and so on."

Existing Federal dams together with construction of authorized and recommended Federal projects on the Columbia and Snake Rivers will provide a continuous waterway extending 495 miles inland from the Pacific to Lime Point, 30 miles above Lewiston, Idaho.

The Corps of Engineers has estimated that with fulfillment of the Columbia-Snake barge waterway plan, average annual commerce for the period 1975–2000 on the system will amount to 9,186,000 tons and yearly transportation savings will be $21,059,000.

The savings figure does not take account of freight rate reductions by other forms of transportation because of barge competition, increase in industry because of the attractions of a flexible transportation system, or development of natural resources which may become economically available because of the benefits of water transportation.

Flood control.—Federal water control projects have provided substantial economic benefits to the Northwest in terms of flood control. The Corps of Engineers estimated in 1958 that the flood damages prevented through the net effect of major reservoir storage and pumping for irrigation at Grand Coulee amounted to $52,070,000 for the period 1949–57. Damages prevented were estimated at $27 million in 1956 and $11,400,000 in 1957.

Projecting planned development of the protected area of the lower Columbia River flood plain to 1985 and utilizing 1957 prices, the corps estimated that total average annual damage reduction attributable to reservoir storage would amount to $22,100,000 with realization of basic flood control objectives. In addition to direct benefits resulting from flood damage prevention, there would be benefits creditable to reservoir storage for land enhancement ($1,200,000) and reduction in cost of levee maintenance ($450,000).

Irrigation.—In January 1959, in a study entitled "Reclamation—Accomplishments and Contributions," the Legislative Reference Service of the Library of Congress reported that:

"As agricultural production in the West changed from initial self-sufficing efforts to the extensive commercial type, and then in some area, to the more intensive commercial specialty-crop development, water supply loomed ever larger as a factor limiting agricultural development. By 1900, about 7.5 million acres of land had been irrigated, entirely by the use of private capital. However, many irrigation company bonds were in default, and further irrigation development appeared at a standstill.

"It was only after the introduction of Federal reclamation projects, that the growth of irrigation developments financed by private capital resumed, and the West soon grew to be a dominant factor in several types of agricultural production. Since that time, the irrigated area of the West has more than quadrupled. Only a little over one-eighth of the increase in new lands is on Federal reclamation projects, but in addition, the Federal projects furnish water supply from other sources, greatly increasing their productivity."

A table is attached showing the distribution of irrigated lands among the States in 1901 along with 1957 irrigated acreages, including figures showing areas irrigated by reclamation projects in 1957.

LRS stated that: "A great deal of irrigation development would have taken place in the West without a Federal reclamation program, but there seems to be a wide agreement that the Federal reclamation program operated as a catalyst * * *." Several studies of individual projects in the Northwest were cited to indicate the economic impact of Federal reclamation programs:

1. "The question of how much income will accrue within an area which, by irrigation, is transformed from sagebrush desert into an area of intensive agriculture, was studied by Marts in the Payette area of southwestern Idaho. He found a ratio of direct to indirect benefits of 1 to 1.27, i.e., that for each $1 of net income or direct benefit accruing to the farm segment of the local population, the total benefit realized, or income generating effects of such primary production within the local economy is $2.27 of which total the nonfarm segment realized $1.27. On the basis of this experiment, he concluded that the economic processes associated with reclamation unquestionably yield an even higher indirect benefit factor on a regionwide basis."

2. "An analysis of retail sales in the three county areas of the Klamath project, along the Oregon and California border shows that per capita sales in the project area were larger than retail sales in either Oregon or California, and some 20 percent larger than in the United States as a whole."

Irrigation provided by multipurpose projects on the U.S. Columbia River System provides similar benefits. A summary of investment in irrigation works associated with the system is contained in the attached tables.

Recreation.—Substantial recreation benefits are associated with Federal multiple-purpose water projects in the Northwest, a region where tourism is a major industry.

Nationallly, in the 3 years from 1955 to 1958 the number of recreation visits rose 50 percent at reservoirs constructed by the Bureau of Reclamation, the Corps of Engineers, and the Tennessee Valley Authority. Total use in 1955 was estimated at 100,152,000 visitor-days, and by 1958 the corresponding figure was 150,851,000.

The Northwest has shared in the historic increase in recreational use of reservoir areas. For instance, visitation to the Coulee Dam recreation area rose from 262,000 visits in 1947 to 449,000 in 1959—an increase of 71 percent. At Detroit Dam, which began commercial power operation in 1953, a total of 113,441 persons visited the reservoir area for recreational purposes in 1955–56. The experience at other major reservoirs has been similar.

Fish and wildlife.—Federal multiple-purpose projects have played an important role in preserving and promoting fish and wildlife. One example is the Columbia Basin project in the State of Washington.

Water for this irrigation project is obtained from the Franklin D. Roosevelt Reservoir behind Grand Coulee Dam and is stored in a 27-mile-long equalizing reservoir. The Potholes Reservoir, located near the center of the project area, was constructed to capture return flows from the northern portion of the project for reuse on other lands.

The Fish and Wildlife Service concluded that significant benefits to fish and wildlife resources would result, amounting to some $1.75 million annually. The Columbia National Wildlife Refuge, now comprising 26,302 acres, was established and constitutes an important link in the national refuge system.

The Department of Interior reports that: "As recently as 1950, the Columbia Basin area consisted largely of arid, though fertile, lands with a few permanent lakes, small towns, and communities. Much of the land was scab rock cut up by deep coulees and sandhills. It supported little game and fish. Today, this area is rapidly becoming one of the most productive of the State's farmlands, with growing towns, increasing amounts of game, and literally fabulous fishing in lakes which now exist where only rock and canyons have lain for thousands of years. The Columbia National Wildlife Refuge and other water areas in the project area are heavily used by waterfowl."

Taxes.—Increase in tax payments is to some extent a measure of economic growth. A study made last year of three predominantly public power States—Nebraska, Tennessee, and Washington—showed that in each individual Federal income tax payments in 1957 were more than twice as great a percentage of the national total as in 1937. Figures for Washington showed that in 1937 Federal income tax payments by individuals amounted to 0.73 percent of the national total and that in 1957 the amount was 1.64 percent of the national total—an increase of 111 percent. Of the Northwest States, Washington realizes the greatest benefit from low-cost Federal power since the major portion of the distribution function is carried out by publicly owned nonprofit electric utilities.

While no one would claim that public power alone has been responsible for this great improvement in economic conditions, these statistics showed a remarkably similar pattern for diverse areas, and indicate that reasonable electric rates have a beneficial effect on the economies of these States.

Amount of repayment of power capital investment, U.S. Columbia River power system, as of June 30, 1959 (operating projects only)

Project	Power capital investment [1]	Repaid as of June 30, 1959	Percent repaid	Net power investment [1]	Repayment ahead of schedule
Bonneville Power Administration	$485,044,469	$121,463,727	25.04	$363,580,742	$43,251,727
Bonneville Dam project	60,455,334	27,189,288	44.97	33,266,046	11,282,288
Columbia Basin project	207,590,313	72,307,664	34.83	135,282,649	0
Hungry Horse project	87,882,566	8,896,496	10.12	78,986,070	0
Albeni Falls project	31,219,953	2,448,188	7.84	28,771,765	582,188
McNary Dam project	278,598,472	21,454,194	7.70	257,144,278	7,072,194
Detroit-Big Cliff	41,919,614	3,940,413	9.40	37,979,201	939,413
Lookout Point-Dexter	41,706,444	2,946,339	7.06	38,760,105	711,339
Chief Joseph project	154,307,853	5,638,924	3.65	148,668,929	1,048,924
Yakima-Kennewick and Roza	4,440,553	430,681	9.70	4,009,872	0
The Dalles project	232,904,278	1,637,373	.70	231,266,905	(239,627)
Total	1,626,069,849	268,353,287	16.50	1,357,716,562	64,648,446

[1] Net of unexpended funds in U.S. Treasury.

NOTE.—Parentheses denote red figures.

Summary of Federal investment in multiple-purpose projects and transmission facilities, U.S. Columbia River power system, as of June 30, 1959, and estimated for completed 17-dam system

	Number of main generators scheduled	Investment in millions of dollars			
		As of June 30, 1959		Estimated ultimate	
		Construction costs	Capital costs	Construction costs	Capital costs
Projects in operation in fiscal year 1959:					
Bonneville Dam	10	84.0	87.6	84.1	87.7
Columbia Basin project	18	525.2	534.9	779.5	[1] 789.2
Hungry Horse	4	101.6	106.3	101.7	[1] 107.7
Albeni Falls	3	30.5	31.5	31.1	32.1
Detroit-Big Cliff	3	61.8	65.9	62.4	66.4
McNary	14	283.6	304.9	286.4	306.9
Lookout Point-Dexter	4	87.0	93.4	87.9	94.3
Chief Joseph	16	145.7	156.8	148.0	158.8
Yakima-Kennewick and Roza	3	35.5	35.7	39.9	40.0
The Dalles	14	238.5	255.4	252.0	269.4
Subtotal	89	1,593.4	1,672.4	1,873.0	[2] 1,952.5
Projects under construction, not yet operating:					
Ice Harbor	3	57.5	59.7	135.0	143.8
Cougar	2	11.2	11.6	42.9	45.0
Hills Creek	2	24.5	25.2	40.0	42.7
John Day	12	10.2	10.5	387.0	422.6
Subtotal	19	103.4	107.0	604.9	[2] 654.1
Total for 17 multiple-purpose projects	108	1,696.8	1,779.4	2,477.9	[2] 2,606.6
Transmission facilities: Bonneville Power Administration		454.5	461.8	656.2	666.9
Total for base system	108	2,151.3	2,241.2	3,134.1	3,273.5
Tentative allocation to power:					
Multiple-purpose projects				1,468.5	1,570.3
Transmission system				656.2	666.9
Total				2,124.7	2,237.2
Add irrigation costs to be repaid from system power revenues				470.4	470.4
Total required from system power revenues				2,595.1	2,707.6

[1] Interest during construction is not included on specific nonpower facilities and for the Columbia Basin and Rosa projects it is not included on the portion of joint and power facilities allocated to nonpower.

[2] Detail by type of facility:

	Millions of dollars			
	Projects in operation in 1959		Projects under construction ultimate	Total ultimate
	To June 30, 1959	Ultimate		
Specific power	624.2	623.5	235.0	858.5
Specific navigation	43.2	43.1	70.5	113.6
Irrigation works	287.4	533.5		533.5
Joint facilities	716.4	752.0	346.1	1,098.1
Other facilities	1.2	.4	2.5	2.9
Total	1,672.4	1,952.5	654.1	2,606.6

NOTE.—Construction costs exclude interest during construction, whereas capital costs include such interest.

Irrigated acreage, 17 Western States

	Total irrigated acreage			Irrigated area,[3] Federal reclamation projects, 1957			
	1900 [1]	1957 [2]	Increase	Full service	Supplemental and temporary service	Total	Percentage of increase served by Bureau of Reclamation
Arizona	185,396	1,150,000	964,604	275,759	64,987	340,746	35
California	1,446,119	7,750,000	6,303,881	676,699	671,118	1,347,817	21
Colorado	1,611,271	2,501,000	889,729	97,694	781,647	879,341	99
Idaho	602,548	2,455,113	1,852,565	408,121	1,004,102	1,412,223	76
Kansas	26,497	844,000	817,503	8,608	0	8,608	1
Montana	970,231	1,900,000	929,769	251,591	0	251,591	27
Nebraska	148,538	2,395,000	2,246,462	204,920	92,016	296,936	13
Nevada	504,168	735,000	230,832	55,240	50,054	105,294	46
New Mexico	204,508	873,000	668,492	198,179	896	199,075	30
North Dakota	5,202	[4] 48,000	42,798	26,489	0	26,489	62
Oklahoma	2,761	294,684	291,923	39,890	0	39,890	14
Oregon	388,198	1,606,500	1,218,302	307,550	104,783	412,333	34
South Dakota	43,010	135,000	91,990	65,727	6,729	72,456	79
Texas	[5] 451,130	6,962,234	6,511,104	50,705	9,745	60,450	9
Utah	629,273	[4] 1,200,000	570,727	15,760	260,033	275,793	48
Washington	135,936	1,002,000	866,064	435,208	164,753	599,961	69
Wyoming	606,942	1,400,000	793,058	201,285	26,978	228,263	36
Total	7,961,728	33,251,531	25,289,803	3,319,425	3,237,841	6,557,266	26
U.S. total	7,978,820	36,537,355	28,558,535				

[1] From H. Rept. 1468, 57th Cong., 1st sess., "Reclamation of Arid Lands."
[2] From "Irrigation, Engineering and Maintenance," Aug. 31, 1958.
[3] From "1957 Crop Report and Related Data," Bureau of Reclamation, July 11, 1958.
[4] 1956.
[5] "1910 Census of Agriculture" (the Reclamation Act was extended to Texas in 1906, but no Federal projects had been built in Texas by 1910).

APPENDIX NO. 9

Resource Development in Tennessee Valley

Federal investment in TVA.—As of June 30, 1960, total appropriations to TVA were $1,976,196,000. Of this total, $1,366,811,000 was for the power program alone.

Payments to Federal Treasury.—From power revenues, TVA has returned in cash to the Federal Treasury a total of $185,059,000, plus another $65 million to retire Federal bonds.

Under Federal law prior to 1959, TVA was required to pay into the Treasury over a 40-year period the funds appropriated for TVA power facilities. This meant that TVA had to make average annual payments of 2½ percent of the net appropriations in TVA power.

Beginning in fiscal year 1961, following passage of the TVA revenue bond financing bill, TVA will make payments to the Treasury under a different formula, as follows: (1) An annual payment to reduce the Government's appropriation investment in TVA power, this payment to be $10 million a year for 5 years, $15 million a year for the next 5 years, and $20 million a year for the remainder of the time until a total of $1 billion is paid. The total appropriation investment in TVA power is now $1.2 billion, so that at the end of the payback period the Government will retain $200 million in appropriation "equity" in TVA power. (2) An annual "dividend," or return on appropriation investment. This will amount to $41.4 million in fiscal year 1961. This "return on appropriation investment" is computed by applying the Treasury's average cost of money on all its borrowing (which was 3.449 percent on June 30, 1960) to the net appropriation investment in TVA power ($1.2 billion on June 30, 1960).

Federal tax collections.—For the fiscal year 1959, payments by individuals in the Tennessee Valley area for Federal income taxes amounted to 6.6 percent of

the national total—about twice as great a percentage as in 1933, the year TVA was created. In 1933, the Tennessee Valley area contributed only 3.4 percent of the national total of Federal income tax payments by individuals.

If the ratio of the Tennessee Valley States had remained at the 1933 level (3.4 percent) during the whole 1933–59 period, the Federal income tax payments by individuals would have been about $14 billion less than it actually has been. It is not claimed that TVA was the sole cause of this impressive economic growth in the region, but it certainly was one important factor. The totals are: actual individual Federal income tax collections in Tennessee Valley, 1933–59, $30.8 billion; estimated payments if Tennessee Valley share had remained at the 1933 level of 3.4 percent, $16.9 billion.

Per capita income.—In 1933, per capita income in the Tennessee Valley was about 45 percent of the national average; in 1959 it had risen to about 65 percent of the national average. This indicates a steady growth in per capita income, but it also shows that the Tennessee Valley still falls short of the national average. In the 1958–59 period, personal income in Tennessee increased 7 percent, as against a 6-percent increase in the Nation as a whole.

In a foreword to a recent booklet published by TVA, the TVA Board of Directors said: "The Tennessee Valley has serious problems which it must meet if it is to lend its full vigor to the Nation's advancing economy. Industry, though making rapid strides, still is inadequate to absorb the underemployed in rural areas. Agriculture is still called upon to absorb a disproportionate share of the population. Incomes still are only two-thirds of the national average. In short, the transition from an agrarian to an urban society, so far advanced in many sections of the country, is here only well begun."

The TVA booklet continues: "The resources for accomplishing that transition are readily available * * *. It remains for the people to fashion and operate the economic and political agencies necessary to organize these resources and put them to work."

Population in the TVA power service area is around 4½ million.

BENEFITS

Flood control.—Original cost of TVA's flood control system was $184 million. Flood damages prevented already total more than $140 million, of which $100 million was saved in the last decade. And the TVA dams will last for many more decades, so it is clear that the flood control benefits will eventually exceed the costs by severalfold. TVA dams help control floodwaters not only on the Tennessee River, but also on the lower Ohio and Mississippi Rivers.

River traffic.—TVA's dams have added a 650-mile navigable channel (from Knoxville, Tenn., to Paducah, Ky.) to the Nation's inland waterways system. River traffic has grown at a rapid rate. In 1945, it was 258 million ton-miles; in 1959, it was 2.13 billion ton-miles—more than eight times as much.

Navigation development has encouraged industrial development. Private industry has invested nearly three-quarters of a billion dollars in waterfront plants and terminals, most of it in recent years.

Recreation.—TVA dams have created "The Great Lakes of the South." Person-day use of recreational facilities has increased from 13½ million in 1950 to 40 million in 1959; value of facilities on lakes has shot up from $20 million in 1950 to $100 million in 1959.

Electric power.—In 1960, average residential users of TVA-generated power paid less than a cent per kilowatt-hour (ninety-nine one-hundredths of a cent), while the average residential use was more than 8,800 kilowatt-hours a year. This compares with national averages of about 2½ cents per kilowatt-hour and usage of about 3,500 kilowatt-hours a year.

APPENDIX NO. 10

Alaska's Power Situation

(By Ivan Bloch, North Pacific Consultants, Portland, Oreg.)

SUMMARY

Our 49th State's power situation presents a paradox unequaled elsewhere in the United States.

With upward of 19 million kilowatts of potential hydroelectric power, over 100 billions of tons of coal reserves, vast resources of natural gas and petroleum, the State suffers from grossly inadequate electric power supplies at extremely high costs to the consumer.[1] Industrial development is completely thwarted by lack of readily available sources of energy, especially electric power. The level of economic development otherwise possible is definitely restricted by such failure to provide energy in abundant quantities at reasonable, if not low, costs.

Basic to this deplorable underdevelopment of power resources is the fact that there exists no policy of any kind—State and Federal—as to the manner in which these resources should be, and can be, developed. Consistent with past neglect of Alaska, the Federal Government at best has provided token but piecemeal attention to the investigation and planning of hydroelectric power resources on either a single- or multiple-purpose basis. Only one hydroelectric plant (Eklutna, near Anchorage, with an installed capacity of 30,000 kilowatts, has been built by the Federal Government. The State, newly born, has indicated a consciousness of both problems and opportunities in the establishment of some sort of State devices for the responsible development of the State's power resources. However, due to lack of funds it has not yet implemented the most fundamental of its obligations. As a consequence, the power needs of local communities have been met by the meager establishment, principally by local rural electric cooperatives and municipalities, of small, very high-cost powerplants, entirely inadequate, at best, for more than the barest of immediate requirements.

In general, therefore, Alaska to this juncture has been restricted to the establishment of a few small local power systems under municipal ownership and rural electric cooperatives, with a few very small private systems, and one Federal power project. Integration and coordination by transmission networks even of those power systems which are physically susceptible of such modern operation is absent. The State's potential contribution to the Nation's needs for very large power supplies for heavy power-using industries has not been recognized at any level of government.

A FEW FACTS

The following tables epitomize the Alaskan power paradox. Table 1, pertinent details of existing Alaska utility power systems, lists electric power systems in operation in Alaska (outside of military and nonutility installations). The largest generating unit is that of the U.S. Bureau of Reclamation at Eklutna, which feeds into the Matanuska and Greater Anchorage area for the three publicly owned distribution systems of that area. The next largest installations are those of Chugach Electric Association, Inc., of Anchorage, with a capacity of 15,600 kilowatts of which 14,500 is in a coal-fired steamplant;[2] the Fairbanks area with two coal-fired steamplants with a total installed capacity of 18,000 kilowatts (under the ownership of the city of Fairbanks and the Golden Valley Electric Association, Inc.); and the Ketchikan Public Utilities installation of slightly over 12,500 kilowatts. By far the greatest number of installations rely on diesel generation in small units. It can be pointed out that, of the total present capacity listed of around 113,395 kilowatts, less than half is in hydro.

[1] A recent report by the U.S. Federal Power Commission indicates Alaskans were paying the highest residential electric bills as of Jan. 1, 1960.

[2] The Cooper Lake hydroelectric project under construction by Chugach and to be energized late in 1960 has an installed capacity of 15,000 kilowatts.

TABLE 1.—*Pertinent details on existing Alaska utility power systems* [1]

Name and location of system	Installed capacity (kilowatts)				Annual kilowatt-hour requirements (in thousands)	Number of consumers
	Hydro	Steam	Internal combustion	Total		
Alaska Electric Light & Power Co., Juneau	1,600	0	2,500	4,100	23,194	3,150
Chilkoot Electric, Inc., Port Chilkoot	0	0	150	150	----------	----------
Glacier Highway Electric Association, near Juneau [2]	0	0	0	0	----------	231
Haines Light & Power Co., Haines	0	0	496	496	600	148
Ketchikan Public Utilities, Ketchikan	11,800	0	837	12,637	34,240	3,142
Metlakatla Power & Light Co., Metlakatla	2,000	0	455	2,455	----------	225
Petersburg Municipal Light & Power, Petersburg	2,400	0	1,250	3,650	5,457	584
Pelican Utility System, Pelican	500	0	225	725	----------	67
Sitka Public Utilities, Sitka	0	0	1,250	1,250	10,000	945
Community Utilities, Inc., Skagway	375	0	525	900	1,088	255
Wrangell Light Department, Wrangell	0	0	920	920	2,472	581
Hoonah Municipal Utility, Hoonah	0	0	170	170	----------	----------
Kotzebue Electric Association, Kotzebue	0	0	*500	*500	----------	119
Nome Light & Power, Nome	0	0	*1,050	*1,050	2,028	528
Meade River Coal Co., Point Barrow	0	0	75	75	----------	----------
Anchorage Municipal Light & Power, Anchorage	0	0	6,736	6,736		
Chugach Electric Association, Inc., Anchorage [2]	0	*14,500	*1,100	*15,600		
Matanuska Electric Association, Inc., Palmer	0	0	0	0	151,996	23,229
U.S. Bureau of Reclamation Eklutna powerplant, near Palmer	32,000	0	0	32,000		
Seward Electric System, Seward	0	0	2,860	2,860	5,961	982
Kenai Lake Electric Association, Moose Pass	0	0	*200	*200	----------	47
Kenai Electric System	0	0	*400	*400	----------	----------
Homer Electric Association, Inc., Homer [2]	0	0	*2,350	*2,350	2,635	*930
Seldovia, Seldovia	0	0	*400	*400	----------	----------
Copper Center Electric Association, Glennallen	0	0	*640	*640	----------	*100
Dillingham Public Utility District, Dillingham	0	0	*500	*500	----------	900
Kodiak Electric Association, Inc., Kodiak	0	0	2,413	2,413	5,877	1,230
Cordova Public Utilities, Cordova	0	0	*1,630	*1,630	2,500	608
Valdez Light, Power & Telephone Co., Valdez	0	0	588	588	1,541	400
Golden Valley Electric Association, Inc., Fairbanks	0	9,500	0	9,500	46,693	7,176
Fairbanks Municipal Utilities, Fairbanks	0	8,500	0	8,500		
Yakutat [3]	----------	----------	----------	----------	----------	----------
Tok Junction [3]	----------	----------	----------	----------	----------	----------
Northway [3]	----------	----------	----------	----------	----------	----------
Nenana [3]	----------	----------	----------	----------	----------	----------
McGrath [3]	----------	----------	----------	----------	----------	----------
Bethel [3]	----------	----------	----------	----------	----------	----------
Platinum [3]	----------	----------	----------	----------	----------	----------
Naknek [3]	----------	----------	----------	----------	----------	----------
Total	50,675	32,500	30,220	113,395	[4] 296,202	[4] 45,577

[1] Data adapted from U.S. Federal Power Commission for 1957 and North Pacific Consultants' data for 1959.

[2] The Cooper Lake hydroelectric project, undertaken by Chugach and Homer, is expected to be energized in late December 1960 with an installed capacity of 15,000 kilowatts.

[3] Not known.

[4] Incomplete totals.

NOTE.—Asterisked items are North Pacific Consultants information.

The insignificance of present hydro development in Alaska is further heightened if one compares the measly 50,000-odd kilowatts of present installed kilowatts (or even the 65,000-kilowatts total when the Cooper Lake hydroelectric project is on the line in late 1960) with the hydro potential for Alaska shown in table 2: "Preliminary evaluation of potential Alaskan hydropower sites." In other words, total hydro development at the end of 1960 will represent less than a one-fourth of 1 percent of estimated potential.

TABLE 2.—*Preliminary evaluation of potential Alaskan hydropower sites* [1]

Region:	*Installed kilowatts*
Southeastern (less Taiya)	790,000
Taiya [2]	2,000,000
Cook Inlet and tributaries	2,000,000
Copper River and gulf coast	2,860,000
Tanana River Basin	500,000
Southwestern Alaska	540,000
Northwestern Alaska	520,000
Yukon and Kuskokwim Basins	11,500,000
Total for Alaska	20,710,000

[1] Data adapted from U.S. Corps of Engineers.
[2] U.S. Bureau of Reclamation.

Reference has already been made to very high power costs, both generated and delivered to the consumer. Table 3: "Some Alaska power costs" provides a few typical examples of actual generation costs and the per kilowatt-hour price paid by the Alaska electricity consumer. Without any question, these are the highest in the Nation, and far above those of the highest level paid in the older 48 States.

TABLE 3.—*Some Alaska power costs* [1]

A. SOME ESTIMATED GENERATED COSTS [2]

	Mills per kilowatt	Dollars per kilowatt year
(*a*) Anchorage area: Energy cost at market	7.87	
Municipal: Capacity cost at market		46.48
(*b*) Fairbanks area: Energy cost at market	9.09	
Municipal: Capacity cost at market		52.36
(*c*) Juneau area: Energy cost at market	13.51	
Private: Capacity cost at market		60.87

B. SOME RESIDENTIAL POWER COSTS—ALASKA AND PACIFIC NORTHWEST [3]

Area	Annual use, residential	Typical monthly bills per month, residential service		
		100 kilowatt-hours	250 kilowatt-hours	500 kilowatt-hours
Alaska:				
Anchorage	3,759	$4.75	$10.00	$14.50
Fairbanks	2,800	8.25	17.50	27.50
Juneau	3,780	5.00	8.56	10.81
Ketchikan	5,801	4.00	6.75	9.88
Homer	1,500	7.50	11.50	20.50
Kotzebue		18.00	30.75	51.00
Alaska (total)	3,484			
Pacific Northwest:				
Centralia, Wash		2.25	3.66	5.41
Milton, Oreg		2.50	4.00	5.50

[1] From U.S. Federal Power Commission "Alaska Power Market Survey," May 1960.
[2] P. 7 of FPC report.
[3] Pp. 82-83, and 67.

Onerous as the burden of underdevelopment and extremely high costs of power may be to the average Alaska resident, it becomes well-nigh intolerable to the commercial operator and a veritable obstacle to sizable industry. (See table 4 "some commercial and industrial power costs—Alaska and Pacific Northwest.") The two large pulpmills which have been established in southeastern Alaska were required to construct and participate in the construction of requisite power facilities, placing a burden of initial capitalization normally not required in the rest of the Nation where such plants can purchase their

requirements from existing power systems. The first attempt to establish a major aluminum industry failed because governmental policies were inadequate to the task of negotiating international agreements with neighboring Canada in spite of the magnificence of the proposed Taiya project near Skagway. As elsewhere testified to and described during the hearings before this committee, the establishment of another large pulpmill in the Juneau area, which would provide much needed employment and a taxable base, hangs in the balance due to the uncertainties of power supplies from the proposed Snettisham project. In this case, Federal policy appears to deny the verities of the fact that adequate power supplies must precede industrial establishment, not follow them.

TABLE 4.—*Some commercial and industrial power costs—Alaska and Pacific Northwest*[1]

Area	Typical monthly bills per month			
	Commercial service		Industrial service	
	3 kilowatts—375 kilowatt-hours per month	6 kilowatts—750 kilowatt-hours per month	12 kilowatts—1,500 kilowatt-hours per month	30 kilowatts—6,000 kilowatt-hours per month
Alaska:				
Anchorage	$14.13	$26.00	$51.90	$161.00
Fairbanks	28.25	52.00	95.40	382.50
Juneau	11.25	22.50	45.00	120.00
Ketchikan	13.25	21.07	39.00	134.38
Homer	28.00	50.50	161.50	395.50
Kotzebue	39.00	71.00	131.00	492.00
Pacific Northwest:				
Centralia, Wash	7.08	15.00	30.00	110.00
Milton, Oreg	9.00	14.00	23.40	76.50

[1] From U.S. Federal Power Commission "Alaska Power Market Survey," May 1960, p. 67.

Finally, there has been no surcease from the continuing spiral of costs which have plagued Alaska since the gold rush days. Power installations are costly because they are undertaken more in desperation than in terms of a wholesome plan, rather than appropriately financed at the lowest possible costs and the longest terms, and constructed by the utmost utilization of competitive bidding based on the most advanced of engineering techniques. There has been an almost disregard by some lending agencies of the peculiar conditions which exist in Alaska wherein reliability of service is not always as important as service of moderate continuity. Under the circumstances, it is indeed a wonder that Alaska's small power systems are as good as they are, reflecting good pioneering engineering and, generally, vigorous and efficient management in spite of meager financial resources for planning, engineering, and supervision of construction.

THE IMMEDIATE SITUATION

Even with the very high costs of power above discussed, the rate of growth in most Alaska power systems has been nothing short of fantastic. Sustained annual rates continue at 10, 15, and even 20 percent per year. Part of this rate of growth is due to individual consumer increases in consumption for all modern types of electrical appliances. Climatic conditions and relative isolation make the Alaskan even more conscious of the benefits of electric power for well-being. In addition, however, and of greatest importance, is that as settlement occurs in the environs of communities, electric service expansion is required. No sooner is a powerline built into the immense countryside than vigorous development of modest as well as substantial homes takes place; commercial structures of all kinds emerge rapidly thereafter. Yet, it has been next to impossible for local power agencies to install adequate generating capacity, to build both transmission and distribution networks to "open up" the environs of communities and to allow individual fullest use of electric power.

If therefore becomes evident that with Alaska's reaching statehood and now in a position to utilize lands heretofore virtually locked up under Federal owner-

ship, an assured way to provide for requisite economic development is to extend and expand existing power systems, and establish new ones, with a minimum of delay. By the same token, with a consistent plan and method for developing power resources—not in the abstract of rarely read reports but in the actuality of imaginative engineering planning—the economic base of the State can be given a chance for the development of free competitive enterprise, reflecting the vast desire of a wide variety of private entrepreneurs to build Alaska.

Federal agencies, notably the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation, have from time to time carried on reconnaissance studies of Alaska's lakes and rivers for power development. The U.S. Geological Survey has installed a small and grossly insufficient number of gaging stations, and the U.S. Weather Bureau has an insufficient network of meteorological stations. The conscientious efforts of these agencies have been stringently restricted by parsimonious allocation of funds, totally inadequate for the basic work of water resources investigations fundamental to sound evaluation of potentials and engineering of control works. There has been no planning whatsoever of the possible benefits of electric system integration by transmission line interconnection save some highly generalized reports that such system planning is desirable. There has been no consideration whatsoever of new and perhaps even untried engineering methods for cutting eventual costs of construction of dam structures (as the possible use of frozen cores) and transmission (as by means of single wire long-distance transmission of reasonable blocks of energy). These serious gaps in getting a start in power development owe their existence largely to a lack of vigorous and consistent exposition of the situation by Federal experts at high levels, and a niggardly response at administration and budgetary levels in the recommending to Congress of reasonable appropriations.

The financing of Alaska power development, as it has been by means of U. S. Rural Electrification loans and through the issuance of relatively high interest revenue and other types of bonds, and in a very few instances through private sources, can only be characterized as difficult for the minimal task so far undertaken. The initial costs of planning and engineering power development have made it extremely hard for small communities to initiate appropriate steps for the financing of adequate power facilities and service. In some instances, engineering services and charges have been characterized by somewhat less than appropriate tieup between engineer and financier. Helpful as the REA has been, it has not provided beyond very rudimentary engineering and organizational field staff to assist intended power groups in the necessary steps of preparing applications for loans. At times, REA's appraisal of power systems has been unduly conservative in terms of estimating power requirements. In several instances, the restrictive nature of the REA Act, though certainly applicable to better developed areas, has and is preventing the utilization of that agency's financial and other resources from bringing the benefits of power to small communities with inadequate power facilities which may be adjoining REA systems, but which cannot participate in joint development under REA regulations.

SOME SUGGESTED APPROACHES

The Alaska power problem and the opportunities for major development of the State's hydropotential require both immediate and long-range action programs. The following summarizes a few observations and recommendations:

1. Project authorizations and appropriations

The specter of critical power shortages in major communities in Alaska was clearly described by nearly all witnesses appearing at the committee's September hearings in Anchorage, Fairbanks, and Juneau. Upon open discussions at these hearings, there appeared to be consensus that the following hydroelectric projects be authorized by the U.S. Congress and immediate appropriations provided therefor:

(1) Bradley Lake on the Kenai Peninsula: project being investigated by U.S. Army Engineers. To alleviate critical shortage expected in Kenai Peninsula, Greater Anchorage and Matanuska Valley areas.

(2) Rampart project on the Yukon: investigations commencing by U.S. Army Engineers. To provide large blocks of low cost industrial power necessary for economic development.

(3) Snettisham project in southeast Alaska: project ready for congressional authorization for construction by U.S. Bureau of Reclamation and appropriation. To provide substantial blocks of power to the Juneau area and for the establishment of a major pulp and paper mill in that area.

With regard to the proposed Susitna (Devil Canyon and Denali projects) on which initial planning studies have been made by the U.S. Bureau of Reclamation, it appeared that the estimates of initial investment required would be very great and the cost of power delivered to the Railbelt area would be relatively high. Thus, further investigation of this project to reduce possible investment costs are required before it is possible to assess the potential benefits of this project.

Further, with regard to the Rampart project, testimony by, and newspaper interviews with the Commissioner of Reclamation dwelt at length on the "lack of existing or foreseeable markets" for the output of this project. It was pointed out, during the course of the hearings by its chairman and some witnesses, that this attitude is redolent of that held in certain quarters during the 1930's which opposed the construction of Bonneville and Grand Coulee Dams in the Pacific Northwest. The record clearly negates this attitude in that it has been clearly demonstrated time and time again that large blocks of electric power at low cost are as quickly absorbed by industry as they are made available. It cannot be stressed sufficiently, apparently, that power availability must precede its use, especially for major industrial development purposes.

In what concerns the Snettisham project, testimony by the Commissioner of Reclamation indicated the U.S. Bureau of the Budget's forthcoming recommendations to the Congress contain the proviso that "non-Federal interests should be encouraged to consider the work." This condition is spurious as there exists no local or State organization which might be interested and which would have the financial and other capabilities to undertake this major public work, let alone at reasonable interest rates and with long-term credit comparable to Federal construction and operation.

2. Financing

The REA Act and administrative regulations regarding long-range loans for power system development appear to present certain obstacles to the desired development of Alaska power resources. In this, the REA is constrained to restrict the construction of appropriate generating plants and transmission systems to the direct needs of so-called rural electric cooperatives. Arrangements for sales of power to municipalities, which adjoin REA cooperative systems in Alaska are limited to short-range "surplus" amounts, over and above the immediate needs of the cooperatives. These provisions of the act and regulations have undoubted merit in more developed areas but might be waived or modified in terms of the peculiarities and urgency of the Alaska situation. It would appear necessary for a study to be made of the REA act and its administrative implementation as a basis for modifications of both to meet Alaskan exigencies.

With respect to the issuance of revenue bonds by Alaska's non-REA cooperatives, such as municipalities, public utility districts and other nonprofit organizations now in existence or which might be formed, the very newness of the State and the pioneer status of its development invariably result in higher financing costs and restrictive bond covenants than in a more mature situation. It is in this area that the State may be in a position to provide the ultimate strength of its credit to facilitate the issuance of local bonds. This is a matter which should have the State's earliest attention, based upon studies of various alternatives which might be available.

In what concerns major hydroelectric projects, including those with multiple purpose features (as for flood control, navigation, public water supplies, recreation, and other features entailing the broad public welfare), it is quite clear that the Federal Government has a major responsibility. This does not preclude the State or some specialized joint agency (such as a regional corporation along the lines of that being proposed for the Columbia River Basin) from exercising jurisdiction. However, the fundamental principle which is urgent of continuous consideration is that the magnitude of most projects require financing at very low costs of money (interest rates) and the longest period for the amortization of initial investment as possible. Whatever device is developed for Alaska's power resource development should include such consideration.

3. Planning, programing, and engineering

Without adequate, continuous records of the hydrology of Alaska's streams and lakes and the applicable hydrometeorology, it is virtually impossible to provide a sound base for the planning, programing, and engineering of the development of the State's water resources. Although, from time to time, program recommendations are made by appropriate Federal agencies as the U.S. Geological

Survey and U.S. Weather Bureau, these are more respondent to immediate rather than long-range needs. It would appear urgent to provide a consistent long-range plan for more adequate hydrologic and associated basic data. The formulation of such a program, and its occasional updating should be undertaken immediately, with programed budgetary requirements.

Less than a handful of the proposed hydroelectric projects have been sufficiently investigated in the field by reconnaissance surveys and geological examinations. Without this basic information, it is virtually impossible to perform even rudimentary engineering planning, basic to the determination of project feasibility. As in the case of hydrologic and hydrometeorological programs, there is need for a long-term program to be undertaken by such Federal agencies as the U.S. Army Engineers and the U.S. Bureau of Reclamation. Sufficient appraisal has been made of potentials to warrant the establishment of schedules of investigations on a consistent, year-by-year program.

As to power markets, the U.S. Federal Power Commission has recently completed Alaska power market survey on behalf of the U.S. Army Engineers. Unfortunately, by the time the report was issued much of its basic information was already out of date, and much of it is considered overly conservative. It would seem desirable for the Federal Power Commission recurrently to bring such power studies on a current basis, and to provide ample opportunity for local power elements and experts to participate in such studies so that the end result will conform with actual situations. Certainly, before such reports are issued, there should be opportunity for review at the local level by all pertinent interests.

With regard to engineering, there is a wide opportunity for the development of new methods for cutting basic costs. These are applicable to dam construction and design, transmission line erection and operations, and undoubtedly other facets of power system development. It would be of great value for local power entities, the State, and the Federal Government to organize a series of symposia in Alaska to program a series of research investigations looking toward the employment of new technologies in this field. It might be suggested that a likely center for such work might be established in conjunction with the U.S. Department of the Army in its proposed arctic research center at Fort Ladd.

4. Organizational aspects of Alaska power development

The harnessing of the tremendous power potential of Alaska poses many problems of organization. Obviously, the magnitude is far beyond the scope and capabilities of small local power groups, excellent as their performance has been to date in the face of enormous obstacles. What is called for is a device or number of devices which can properly mesh the capabilities of Federal agencies, the State, and local power entities into planning, engineering, financing, and operational aspects of the total picture. For instance, the integration of power systems in the railroad belt is a now recognized need. However, it is not clear what agencies, at any level, can undertake the necessary engineering, let alone the financing of construction of requisite transmission lines and terminal facilities.

Fundamental to the effective development of Alaska's power resources is the financing from planning to execution of the entire as well as individual complexes involved. The Alaska State Legislature, at its last session, recognized much of this problem by requesting one of the State departments to make certain studies of this area as it might involve State organization. It is to be hoped that the study will be sufficiently broad gaged to permit the formulation and introduction of appropriate Federal legislation to facilitate Alaska's power development. In such formulation, it is imperative that the best experience and thoughts available in the Nation be marshaled.

APPENDIX NO. 11

Alaska's Power Resources in Relation to Mineral Development [1]

(Ivan Bloch & Associates of North Pacific Consultants, Portland, Oreg.)

A large number of potential Alaskan hydropower sites appear feasible of development. Some of them are favorably situated to facilitate the utilization of

[1] Paper delivered before the San Francisco meeting, Apr. 29 to May 3, 1956.

the Territory's mineral resources such as Fe, Cu, Ni, chromites, and possibly others. With decreasing availability of abundant, low-cost supplies of hydroelectricity in the 48 States, Alaska's power potential warrants immediate consideration, especially in the southeastern and central portion accessible to tidewater for electroprocess industry establishment.

The enormous expansion of electroprocess industries in the United States combined with equally enormous consumption of electric power for other industrial, residential, and commercial purposes, has resulted in a rapid exhaustion of large, low-cost hydroelectric power supplies. Although the utilization of large coal properties for mine-mouth electric steam-generating plants in various parts of the United States will provide large blocks of comparatively low-priced electricity for electroprocess industries, it will not be adequate for the electric furnace and electrolytic cell treatment of many mineral substances located long distances from consuming markets.

In the North Pacific region of America there are enormous hydroelectric potentials, largely unexplored and of great logistic importance for the processing of mineral ores known to exist in those areas. The tremendous development of hydroelectric power in the Kitimat-Nechako, Kemano area of northern British Columbia is clear evidence of the interest of industry in the North Pacific region.

This paper deals in summary with Alaska and its various hydro potentials. In exemplary manner, it points to the potential utilization of some mineral ores as well as to the positive establishment of electroprocess industries in the Territory.

GENERAL DESCRIPTION OF ALASKA BASINS

The hydroelectric potential of Alaska, now believed to be in excess of 16 million kilowatts, is examined in terms of major regions and subareas. These are:

Southeastern Alaska region (potential—over 2¼ million kilowatts): (*a*) Ketchikan area, (*b*) Wrangell area, (*c*) Sitka area, (*d*) Angoon area, (*e*) Juneau area;

Southwestern Alaska region (potential—over 4¼ million kilowatts): (*f*) Gulf of Alaska area, (*g*) Matanuska Valley area, (*h*) Susitna Basin area; (*i*) Kenai Peninsula area, (*j*) Bristol Bay, Alaska Peninsula, Aleutian and Kodiak Island;

Central Alaska region (potential—over 10 million kilowatts): (*k*) Kuskokwim Basin area, (*l*) Upper Yukon Basin area, (*m*) Middle and Lower Yukon Basin area, (*n*) Tanana Basin area;

Northern Alaska region (potential—over ¼ million kilowatts): (*o*) Seward Peninsula area, (*p*) Arctic region area.

In each of these areas will be found physiographic and climatic characteristics which generally will control the type of eventual hydroelectric development.

Both the southeastern Alaska and Kenai Peninsula areas have a substantial number of lakes emptying into short, rapid streams providing considerable hydraulic head. The major portion of potential hydroelectric sites in these two regions, therefore, entail the tapping of lakes by means of tunnels, pipelines, and penstocks to high-head turbine installations. A few streams in those regions are susceptible of development by means of low-head dam installations and transmountain diversion.

On the other hand, the Yukon, Kuskokwim, Susitna, Tanana, and Copper Rivers—each with very large drainage basins and consequent large stream flows—will be developed by means of substantial reservoirs, created by large dams, and providing very large individual generating capacity potentials.

Most of the proposed installations at southeastern Alaska and Kenai Peninsula powersites involve lakes containing little or no sediment. Contrariwise, most of the large rivers are heavily laden with the products of erosion and glacial action and contain substantial sedimentary materials carried as bed load.

The southeastern Alaska region is one of very heavy rainfall at lower elevations and substantial snowfall in the mountains. Temperatures are moderate and not unlike those which occur in the Puget Sound area, increasing in severity with distance from the coastal areas and altitude of the land masses. The southwestern Alaska region contains a number of different climatic regions. The Kenai Peninsula, coastal Gulf of Alaska and Bristol Bay areas which adjoin ocean and tidal waters are characterized by somewhat more rigorous but still moderate climate. Rainfall and snowfall are heavy along coastal areas, but decline in interior areas, with much lower winter temperatures.

The regions which contain the Yukon, Kuskokwim, Tanana, Seward Peninsula, and Arctic drainages are subject to extremely low and long-duration winter temperatures, sometimes surprisingly high summer temperatures, with moderate annual precipitation.

Although long visualized as a region of forbidding physical and climatic aspects, remote from civilization, even the farthest reaches no longer are considered beyond the possibility of development. Recent experience gained in Arctic operations of both the military and civilians tempers the awe naturally stimulated by past account of long periods of subzero temperatures, and boundless areas of mountainous or tundra terrain. The very physiographic and climatic characteristics which have presented barriers to general development in the past may well be turned to advantage in large-scale development of hydroelectric resources.

Alaska's population, estimated at some 225,000, is largely concentrated in the southeastern, Kenai Peninsula, and Fairbanks areas. Anchorage, at the head of Kenai Peninsula, at the upper end of Cook Inlet, is the largest city and modern in every sense. The Greater Anchorage area which includes Anchorage and its immediate environs stretching into the famed Matanuska Valley, now has a population well in excess of 100,000. Fairbanks, to the north, is also a completely modern city, serving an area with a population of close to 50,000. It is served by the Alaska Railroad from the ports of Seward, Whittier, and Anchorage. Southeastern Alaska contains a number of communities. The capital of the territory, Juneau, has an area population of 16,000. Other communities include Ketchikan, Wrangell, Sitka, and Petersburg.

Transportation is well developed for all of the territory. The airplane is possibly the most important means of transportation and it serves every area of Alaska with modern equipment operating both on regular schedules or by charter. Four major scheduled airlines operate in the inter-Alaska service, and a European airline is scheduled for transpolar service between Europe, the Orient, and west coast cities. Ocean vessel as well as oceangoing barge services are well established to major ports of the territory. Sea-train service is projected from Puget Sound points to Gulf of Alaska terminals. The Alaska Railroad serves an area from the Gulf of Alaska, via Anchorage to Fairbanks. An excellent network of good, surfaced highways serves major points. These highways interconnect with the Alaska Highway, and traffic of all kinds, including modern trucking, is continuous the year around. A new type of transportation in the areas north of the Arctic Circle is now established. This consists of "Cat-trains" and the specially built "snow-trains."

Alaska's economy is undergoing a transition of considerable importance. The tremendous increase in population during the past 10 years, especially in the Greater Anchorage and the Fairbanks areas, in very large measure has been due to construction activities required in the establishment of large military bases. However, a noticeable stabilization of population and of the related economy is taking place. The pattern seems to parallel that observable in the historical development of the West, which centered about the establishment of military outposts and garrisons. That is to say, people drawn to Alaska in the main by construction activity are putting down their roots in the territory, building and purchasing modern homes, engaging in commercial and service establishments, and gradually building a sizable agricultural economy in the Matanuska and Tanana River valleys.

Although it is common to view Alaska as an area of very high labor costs, this is not the case in enterprises with steady all-year employment activity. The most striking example is in the well-established contract between the U.S. Smelting, Refining, and Mining Co. in Fairbanks, and the local AFL Union, which sets forth rates comparable with those prevailing in the Puget Sound area.

In an area of about one-fifth that of the 48 States, which until recent years has been considered remote and inaccessible, it follows that much of the area is unexplored. There is a dearth, for example, of reliable, long-term information on streamflows, hydrologic data, and on the geology of potential waterpower sites. Although the geologic literature on mineral discovery and development is substantial, it remains sketchy for many large areas. Further, it reflects traditional interest in precious metals such as gold. The analysis, therefore, of mineral potential in relation to hydroelectric power development must be of most preliminary nature.

In the following sections, an attempt is made to sketch some principal possibilities of development. It is believed that, with the passage of time, the importance of many developments will be much greater than can be anticipated.

SOUTHEASTERN ALASKA

Total potential installed kilowatts: Over 2¼ million

This region comprises the large archipelago and the land strip which is the southern Panhandle of Alaska. It is bordered on the east by British Columbia, and on the west by the Pacific Ocean. The region is very mountainous, with long inland fjords. One of the greatest rain forests of the world cloaks the area which, as a consequence, is now well on the way to becoming a principal producer of pulp and other forest products. Major communities include Ketchikan, Wrangell, Petersburg, Sitka, Juneau, Haines, and Skagway.

The hydroelectric potential (for units in excess of 5,000 kilowatts installed capacity) is estimated at a total of over 2 million kilowatts.[2] As previously noted, most sites involve relatively small individual units, from 10,000 to 70,000 kilowatts, usually involving the tapping of lakes at moderate altitudes. Power costs from these plants are conservatively estimated as 5 to 12 mills per kilowatt-hour averaging 6 to 7 mills per kilowatt-hour.

One outstanding potential project is the Yukon-Taiya project located near Skagway. It involves utilization of seven Canadian (Yukon Territory) lakes on the Yukon River above Whitehorse, Yukon Territory, by diverting these flows across the Alaska-Canadian border near Skagway and dropping them to sea level at the head of deep-water Lynn Canal. The projects's main features involve tapping Sloko Lake into Atlin Lake, thence into Taku Arm Lake, Marsh, and Tagish Lakes, into Bennett Lake, reversing the flow of Lindeman Lake and dropping 2,800 cubic feet per second of water through the Coast Mountains by means of a 14-mile tunnel to the powerhouse. An ultimate power capacity ranging from 900,000 to as high as 2 million kilowatts has been indicated. Estimates of possible power costs from this huge project have varied, but are all in the general range of 2 mills per kilowatt-hour. The Taiya project's projected powerplant is at the head of Lynn Canal near Skagway and Haines, with industrial plant site areas within less than 25 miles.

Because of the international character of the project, its construction poses substantial problems. On the one hand, diversion of the Canadian water of the upper Yukon drainage basin would affect navigation and power potentials of the Yukon River further downstream in Alaska, a matter of grave concern to the United States. On the other hand, diversion by means of this project would, in effect, utilize Canadian waters for power production in Alaska, a matter which the Canadians look upon with some disfavor.

As a consequence, other schemes have been recently investigated by Canadian industrial interests. One scheme in particular would involve utilization of approximately the same watershed of the upper Yukon as for the Taiya project, but diverting the flows to the head of Taku Inlet (in Canada), a tidal body to the east of Juneau. Power capabilities for this scheme would be substantially less than for Taiya. Power production would be all-Canadian, but access to deep-draft navigation would necessitate crossing the American Panhandle of Alaska. In addition, there are sizable physiographic limitations regarding plant sites and access thereto.

Therefore, development of either project must await resolution of some rather difficult international problems between the United States and Canada. It appears, however, that the Taiya project is far superior in every respect to alternative suggestions so far made for the use of this section of the Yukon watershed.

The possibilities of interconnecting the potential hydroelectric sites of southeastern Alaska by high-voltage transmission networks are limited because of the rugged topography and the relative isolation of individual sites. Some grouping by a combination of overland transmission lines and submarine cables is indicated as warranting further consideration. Suggested groupings are the following: (*a*) Ketchikan area—Grace, Mirror, Ella, Manzanita, and Swan Lakes; (*b*) Wrangell area—Cascade and Scenery Creeks; (*c*) Sitka area—Green, Blue, and Takatz Lakes; (*d*) Juneau area—Long, Crater, and Dorothy Lakes, Speel River.

Thus, development of most of these sites will be for utilization in generally close proximity to powerplants. Suitable areas for industrial or processing plant location are limited or will require very careful consideration because of the sharply rising nature of the terrain from tidewater.

There are at least three possibilities of interest regarding the utilization of southeastern Alaska's power potential for mineral beneficiation and processing.

[2] This total includes the Taiya project with a potential listing of 1,600,000 kilowatts.

These include the utilization of the very large quantities of magnetites in the Klukwan area near Haines in the Chilkat Mountain range. There are also apparently extensive nickel-bearing ores in the Takobi-Chichagof-Baranof Island area, and copper-bearing areas in various parts of the archipelago, especially on Prince of Wales Island and in the Ketchikan area. Considerable exploration of these principal minerals has taken place within the last few years. Tonnages are great, with grades quite variable. Should the Yukon-Taiya hydroelectric project be built, a sizable portion of its output would be consumed by electric furnace treatment of the Klukwan magnetities. Similarly, processing of the relatively low-grade nickel-bearing ores by electric furnace means (possibly by the density carbon or dry-top method developed by the U.S. Bureau of Mines at Albany, Oreg.) appears worthy of considerable attention. Regarding the copper-bearing materials of the area, electric-matte smelting might provide a satisfactory economic answer to their exploitation. These possibilities are within the foreseeable future, and promising hydroelectric sites (in addition to Taiya) are favorably situated with respect to major ore bodies. Companies most prominent in evincing interest in the location of electroprocess industries in this area are the Aluminum Co. of America, Reynolds Metals Co., and the Frobisher interests of Canada.

SOUTHWESTERN ALASKA REGION

Total potential installed Kilowatts: Over 4¼ million

This enormous region contains some of the most interesting power potentials for mineral and electroprocess industry development. The hydroelectric possibilities of the Gulf of Alaska, the Matanuska Valley, Susitna and Kenai Peninsula area are susceptible of eventual interconnection by means of a high-voltage and high-capacity electric transmission system. It is in this general area that the major portion of Alaska's population resides, and therefore it is the principal center of economic activity in the territory. Physiographic conditions are such that major land communication routes are well developed, and there exist numerous areas accessible to tidewater which offer facilities for industrial plant establishment.

The largest individual hydroelectric potential is that of the Copper River. The principal project is at Wood Canyon, a few miles below the confluence of the Copper River. The principal project is at Wood Canyon, a few miles below the confluence of the Copper and Chitina Rivers, at which point the combined runoff of two valleys, draining an area of 24,000 square miles, flows through a deep rock-walled canyon. About 35 miles below Wood Canyon is a site which appears favorable for the construction of another large dam. Conservative estimates place the potential installed capacity of these two dams in excess of 1,500,000 kilowatts and prime power capabilities of over 1,100,000 kilowatts. A preliminary appraisal of power costs at the two plants is around 3 mills per kilowatt-hour although this figure is very conservative.

Of particular importance with regard to the Wood Canyon and peninsula site projects is that the upper dam would create a reservoir about 100 miles long. This reservoir would extend into the Chitina Valley to the abandoned site of the famous Kennecott operations (Kennecott Copper Co.), and up the Copper River into the Copper Center-Gulkana area. This reservoir would provide an excellent possibility for the establishment of barge transportation to highly mineralized areas now inaccessible except by air or very arduous surface trails. Industrial plant site areas in the vicinity of Chitina or the upper end of the proposed reservoir near Copper Center would have access to the Edgerton cutoff highway and the Richardson highway into Valdez, with its all-year ocean port. Considerable headway is being made toward the building of a highway along the right-of-way of the abandoned Copper River and Northwestern Railway, built by Kennecott in the early 1900's from the Cordova area, with its all-year port up the Copper River past the peninsula dam and the Wood Canyon sites to Chitina. A highway has been built from Cordova to the Copper River; the route from this area upriver will require some modification, depending on the possible construction of the Copper River dams.

There are many other powersites on various tributaries of the Copper in its headwaters such as the Nizina, Kennecott, and Tebay in the Chitina drainage; the Tonsina, Klutina, and Tazlina in the upper Copper drainage; and the Bremmer and Tiekel Rivers below the Wood Canyon site. Preliminary estimates show power costs in ranges between 9 and 15 mills per kilowatt-hour. However, as will be the

case with most Alaska powersites, investigations have been meager and on a bare reconnaissance basis. It would appear that additional investigations will lead to the development of construction plans for much lower power rates than now estimated.

The Matanuska Valley area has interesting hydroelectric potentials. The largest of those involves a most unusual scheme of development proposed by Reuben Hack, an engineer with the U.S. Corps of Engineers in Alaska. Considerable reconnaissance work carried out by Mr. Hack on his own responsibility shows remarkable possibilities for a power scheme having an installed potential capacity of between 120,000 and 190,000 kilowatts with high prime power capabilities.

The Hack scheme for the Lake George project contemplates using the Knik Glacier as a permanent dam to make possible the full use of waters impounded intermittently in back of the glacier. Under present conditions, Lake George represents the annual accumulation of runoff from an area of approximately 870 square miles, of which 40 percent comprises glaciers and perennial ice fields. Each year, in July or August, the lake overflows the ice barricade across the valley, cutting a channel which widens as its undercuts the glacier front, and empties into the Knik River below the glacier in a torrential flow which lasts only 8 to 10 days. After the lake empties, the glacier continues its advance and again blocks the channel to repeat the annual cycle. The estimated annual runoff is in excess of 3½ million acre-feet.

In the Hack scheme, one or two large tunnels would be driven through the valley wall (ahead of the glacier front) from the lake to a powerplant below the glacier. The tunnels would act both as spillways to pass excess waters below the glacier and as penstocks to the powerplant. As a consequence, the Knik Glacier would advance against the valley wall, permanently closing the gap or channel which is now cut each year by the overtopping waters of Lake George. Although several questions come to mind, sufficient reliable information is available to indicate that the Hack scheme merits careful consideration.

Power costs from the Hack scheme would range from slightly over 3 mills to slightly under 4 mills for various load factors at the powerplant, and between 3½ and slightly over 4 mills transmitted to the Anchorage area, approximately 50 miles distant.

Other power potentials of the Matanuska Valley include the Matanuska River itself, Caribou Creek, and others. The Eklutna project, constructed by the U.S. Bureau of Reclamation, began operations in 1955. This project involves the tapping of a high mountain lake by means of a long tunnel driven through a mountain massif, dropping the waters to the powerplant at near tidewater elevation on Knik arm. The output of this 30,000 installed kilowatt project is transmitted to the Matanuska Valley communities and to the Anchorage area by means of a 115-kilovolt transmission line.

Until the Eklutna project began operations, the Anchorage and Matanuska Valley area depended entirely on thermal power generation. A substantial portion of this generation is obtained by means of modern steam-electric plants in Anchorage and immediate environs utilizing coal from the fields in the lower Matanuska Valley.

The Kenai Peninsula contains a number of relatively small hydrosites. Their development is of considerable importance, not only for the rapidly growing population of the Anchorage area, as well as of the Matanuska Valley and peninsula area, but also in terms of potential mineral development. It is significant that active planning is underway for the construction of a regional high-voltage, high-capacity transmission network by the Central Alaska Power Association, Inc.[3] This network would interconnect the various sites of the Kenai Peninsula, starting with the extremely interesting Bradley Lake at the southwestern extremity of the peninsula, picking up Kasilof and Kenai River development sites, and then the sites involving the tapping of mountain lakes including Cooper, Crescent, Juneau, Ptarmigan, and Grant. Under preliminary design also is a single-span transmission line crossing of Turnagain arm to interconnect into the present Anchorage-Matanuska Valley power systems; this single span, if determined feasible of construction, will be the world's largest, or approximately 12,500 feet long.

[3] A local power agency at present composed of a number of aggressive rural electric cooperative corporations.

At present, a detailed engineering report has been completed on Cooper Lake,[4] and engineering studies are under way on Crescent Lake.[5] It is possible that construction will start on Cooper Lake in the summer of 1956. This project would have an installed capacity of 15,000 kilowatts and will tap Cooper Lake by means of a short tunnel, pipeline, and penstock dropping some 740 feet to a powerhouse on Kenai Lake.

With the exception of Bradley Lake, most of the Kenai Peninsula power projects involve estimated power costs ranging from slightly over 5 mills (for Cooper Lake) to around 11 mills per kilowatt-hour.

In terms of potential mineral development, Bradley Lake appears to offer the most significant opportunities, especially when considered as a part of the regional transmission network proposed by the Central Alaska Power Association. Present reconnaissance investigations by the U.S. Corps of Engineers and U.S. Geological Survey show that power installations of 30,000 kilowatts may provide costs of between 3 and 4 mills per kilowatt-hour depending on load factor. Capacity available on better than 90 percent load factor would be in the neighborhood of 40,000 to 50,000 kilowatts.

The Susitna Basin, almost directly north of Anchorage, contains some sizable potential hydroelectric sites. Reconnaissance surveys indicate at least three of them with prime power capabilities of around 200,000 kilowatt. Cost estimates for these are somewhat high, probably about 9 mills per kilowatt-hour, but such estimates undoubtedly err on the high side. These sites lie along the general route thought feasible for interconnection by means of the transmission network discussed later.

Draining into Cook Inlet from the northwest are two important rivers, the Beluga and the Chakachatna. Three possible sites have been reconnoitered for a prime power total of around 150,000 kilowatts. These might have some future importance, with reference particularly to the development of the Beluga coalfields.

Along the base of the Alaska Peninsula and into the Bristol Bay area are a number of streams and lakes. These are generally of small individual hydro potential, and costs are roughly estimated at 8–15 mills per kilowatt-hour and upward. The same situation prevails generally along the Aleutian Peninsula.

Attention has been given to the desirability of constructing a large-capacity and high-voltage transmission system to interconnect the Copper and Chitina, Matanuska, Anchorage, and Kenai Peninsula projects, thence northward up the Susitna Basin to the drainages in which Fairbanks may be considered centrally located. Preliminary studies have been made by various governmental agencies, by the Central Alaska Power Association, Inc., and by North Pacific Consultants of what would be one of the Nation's largest power grid systems. There appears to be sufficient hydrologic diversity between the various drainage basins to provide definite advantages for large-scale interconnection. Such a power network would make possible the large-scale utilization of the coal resources of the Matanuska, Beluga, and Healy fields by means of steam-electric plants located at mine-mouth. At this juncture, the economics of such a system are not sufficiently clear to warrant an opinion as to ultimate feasibility, but the national power situation urges immediate study and consideration for the portions interconnecting the Copper River areas with those centering about Anchorage and the Kenai Peninsula.

The area described above is immense, and portions are known to be highly mineralized. There is not much question, for example, that the Copper and Chitina drainages contain very large reserves of copper-bearing ores. The abandonment of the Copper River and Northwestern Railroad in the 1930's withdrew the Chitina River area from access; most of the rest of the area is incredibly rugged. The combination of a reservoir such as would result from the construction of the Wood Canyon Dam together with large blocks of low-cost power would not fail to open up a territory rich in mining possibilities. The extent to which electric copper-matte smelting could be conducted near the Wood Canyon site, with ores or concentrates being barged to a plant site in that area, is of course subject to considerable study. However, it would appear to be a logical way to provide high-value matte which could then be trucked down to Valdez of Cordova for transshipment to oceangoing vessels.

The possibility of opening up the area to barge transportation over the reservoir would no doubt stimulate exploration and development so far frustrated

[4] Under the auspices of the Central Alaska Power Association.
[5] Under the auspices of the city of Seward.

by access difficulties. Occurrences of nickel, lead, zinc, and other ores have been reported over the years, but relatively little has been done to explore the area with modern means.

The possibilities of establishing large units of electroprocess industries based on waterborne imports from Pacific Basin countries in the Valdez-Cordova areas, served by means of an appropriate transmission system from the various large hydroelectric sites in the Copper and Chitina Basins, are also worthy of attention. To date, Harvey Aluminum, Inc., has obtained a preliminary permit to investigate the Wood Canyon site for precisely that type of power utilization.

As mentioned before, the Bradley Lake potential hydrosite also has much merit for investigation with relation to mineral development. The proposed powerplant is at the head of Kachemak Bay. At the mouth of the bay, in the Seldovia area, are the well-known chromites of the Kenai Peninsula. Mining operations, which have been underway on portions of the deposits, have been for the purpose of shipping metallurgical, lump chromite. Reserves of other chromites suitable for simple concentration are known to be substantial. The possibilities of an electric furnace operation for the production of various grades of ferrochrome should be considered as good, especially with low-cost power from Bradley Lake and its interconnection with the proposed transmission grid system of the Central Alaska Power Association. Plant sites which might be suitable for the establishment of concentrating and furnace operations would have access to all-year oceangoing transportation.

Of some interest also are possibilities of calcium carbide furnace operations in the same general area, possibly centering at Homer on Kachemak Bay. In this respect, limestones of varying quality are available on Kachemak Bay, and it appears worth investigation to utilize some of the better seams of the Homer area coals for the production of a metallurgical char. Some investigations of this possibility as well as of the ferrochrome operation are underway in a preliminary manner. There is also much discussion of the feasibility of establishment in that area of an ammonium nitrate plant similar to that now operating in Iceland.

The eventual development of power resources in this entire area would have beneficial effects on the expansion of mining activities for gold, platinum, and possibly for other materials such as molybdenum. As pointed out previously, the area is vast and relatively unexplored, so that appraisal of mineral utilization potential cannot be more than sketchy beyond the examples cited.

CENTRAL ALASKA REGION

Total potential installed kilowatts: Over 10 million

The principal rivers of this tremendous land mass are the Yukon, the Kuskokwin, and the Tanana. Remote and enormous, these rivers until recent years were not considered as having much hydroelectric potential. For the most part, they flow sluggishly with great volume, meandering across great areas of uninhabited country. However, reconnaissance, particularly by the U.S. Corps of Engineers, is changing the former appraisal greatly. It now appears that their hydroelectric potential may be among the worlds largest. Three sites have potentials ranging from 1½ to over 3 million kilowatts each of installed capacity, and estimates of the prime power capabilities of these are on the order of 75 percent of installed capacity. Information so far available does not permit indicating possible power costs, but they may be surprisingly low and suitable for industrial utilization.

Obviously, the development of industrial interest in these sites must be related to accessibility. In that regard, the Kaltag site on the lower Yukon is about 275 miles up the river from Norton Sound on the Bering Sea. Past experience with river-boat and barge commerce along the Yukon for almost its entire length would lead one to conclude that this method of transportation is worthy of consideration when open-water navigation is possible during the summer. The same observation regarding water transportation might be applied for the Rampart Circle and Woodchopper sites. Obviously, these are items necessitating careful analysis.

Interconnection of the hydrosites of this area by an extension of the power system described in the previous sections may be desirable and feasible ultimately.

It is not possible to sketch any specific examples in which the development of the waterpower resources of this area would be advantageous to mineral development. Substantial placer mining for gold is continuing, and possibly the availability of system electric power would assist in its expansion. The immensity of the area and its isolation still place it in the general category, mineralwise, of terra incognita. However, there are a number of operations in the area for a variety of minerals. Among those known to exist in variable quantity are silver, zinc, lead, antimony, barite, tungsten, tin, bismuth, mercury, and others. In addition, the Healy coalfields near Fairbanks have been operated for many years. The availability of high-quality limestones in the Windy area on the Alaska Railroad about two-thirds of the way from Anchorage to Fairbanks has also stimulated some interest in the establishment of a cement plant to meet the substantial needs for that material in Alaska.

NORTHERN ALASKA REGION

Total potential installed kilowatts: Over one-quarter million

Most of this area adjoins and is above the Arctic Circle. Several of the large rivers possess substantial summer flows. Surveys have been limited to reconnaissance with interest developing to the point where previous examinations are in the process of revision. The potential susceptible of development may exceed 400,000 kilowatts of prime power. The Noatak River, for example, which empties north of Kotzebue, may possess well in excess of 250,000 kilowatts of prime power. The Colville, which empties into the Arctic Ocean east of Barrow, is by far the largest river of the entire area, but its potential is unevaluated.

Mining operations at present are centered in the Seward Peninsula in the vicinity of Nome. Minerals of interest include gold, silver, lead, zinc, antimony, bismuth, graphite, platinum, mercury, and tin. Most operations depend on captive diesel-generated electric power at high costs. Eventual development of the hydropotential of the area might facilitate expansion of mining activity.

GENERAL NOTES

As noted above, there are at least two areas of immediately promising hydroelectric development: southeastern Alaska with the Taiya-Yukon project, and southwestern Alaska with the Cooper River (Wood Canyon and peninsula sites), and the Matanuska-Anchorage, Kenai Peninsula, Susitna areas (Lake George, the Central Alaska Power Association developments, and Bradley Lake). These areas combine potentially large blocks of power at costs competitive with those projects remaining in the Pacific Northwest, with access to deep-draft ocean transportation and available population with a substantial labor force. Although mineralization is known to be extensive, the outstanding possibilities are in the electroprocess utilization of iron, nickel, copper, and chromites of the two areas.

In the development of some of the enormous hydropotential of such rivers as the Yukon and Kuskokwim, such work of an investigatory nature must be performed. In this, new engineering approaches must be devised to make feasible lowest cost design and construction of dam and control structures. That is, it is within reason that climatic and soil conditions which appear at first to provide obstacles may well be turned to advantage. For example, considerable thought is being given to permenantly frozen earthen structures.

High-voltage, high-capacity networks to transmit huge blocks of hydroelectric power are not unusual in the modern world. Their construction and operation under conditions prevailing in Alaska, however, will require adept use of engineering principles. A promising start is being made in the plans of the Central Alaska Power Association for interconnecting the power potentials of the Matanuska-Anchorage-Kenai Peninsula area.

It is also quite probable that the hydropotential of Alaska, especially southwestern, central, and northern regions, will be developed in concert with the establishment of large coal mine-mouth steam-electric plants, as well as of nuclear reactor powerplants. Regarding the latter, preliminary discussions are now underway for two reactors of approximately 10,000 kilowatts capacity.

APPENDIX NO. 12

Industrial Location Facts of Greater Anchoragee, Matanuska Valley, and Kenai Peninsula Area, Alaska

Prepared for Chugach Electric Association, Inc.

(By Ivan Bloch and Associates)

LOCATION

The Kenai Peninsula, representing the major portion of the area of this presentation, is one of the most prominent physiographic features of the mainland area of Alaska. Centering roughly at 60° latitude north and 150° longitude west, the peninsula is bounded by the Gulf of Alaska on the east and south; Cook Inlet, a large tidal arm, forms its northwestern boundary. The largest city of Alaska, Anchorage, is located north of the peninsula across Turnagain Arm, another large tidal arm, and is separated from the Susitna Basin by Knik Arm, a continuation of Cook Inlet. The upper end of Knik Arm receives the Matanuska River whose valley runs from the interior in a southeasterly direction.

The entire area covered in this presentation is one of marked contrasts. Running in a northeasterly direction from the tip of the Kenai Peninsula and into the interior are the Kenai and Chugach mountain ranges, extremely rugged, with peaks of 7,000 to 12,000 feet in altitude with large perpetual glaciers such as the Harding Icefield. To the northwest of these ranges to Cook Inlet and Knik Arm are the broad plains of the Kenai Peninsula and Anchorage and Matanuska Valleys, with large portions suitable for agriculture and some already under cultivation.

At the extreme southern tip of the Kenai Peninsula where Cook Inlet opens into the Gulf of Alaska is Kachemak Bay on which are located Seldovia and Homer, the two major communities of that portion of the area. Starting at Homer, sweeping along the northwesterly coast of the Kenai Peninsula on Cook Inlet, is a vast flat area, along Cook Inlet, much of the land is considered suitable for agriculture; inland, the terrain is rolling with large expanses of poorly drained areas containing a multitude of lakes. A number of small communities are located along Cook Inlet among which are Ninilchik, Kasilof, and Kenai.

Seward, one of the two present all-year ports of the area, is on the Gulf of Alaska, on the southern edge of the Kenai Peninsula. Whittier, the other all-year port in northeast of Seward, on Prince William Sound.

Anchorage is in a flat plain area, essentially peninsular in character, bounded by Turnagain Arm, Cook Inlet, and Knik Arm. The Chugach Mountain range—rugged and with high peaks ranging from 8,000 to 12,000 feet in altitude—looms to the east, so that the plain on which Anchorage is located varies in width from about 10 miles to about 1 mile near the head of Knik Arm at Eklutna.

At the northern end of Knik Arm is the famed Matanuska Valley. This is a relatively level valley, the site of extensive agricultural development, in which are centered the communities of Palmer and Matanuska. A few miles northeast of Palmer are the Matanuska coalfields which supply fuel to the Greater Anchorage area.

CLIMATE

There is a considerable range of climate in the area of this presentation. All of the area, however, is influenced by the proximity of the Pacific Ocean and nowhere sustains the extremes found in the interior. The severity and dryness of the climate is roughly proportional to distance from the Gulf of Alaska.

Whittier, with an annual precipitation of 174 inches represents one extreme. Most of the area is considerably drier, with Anchorage and the Matanuska Valley averaging 13 and 16 inches of precipitation a year.

The U.S. Weather Bureau official description of the Anchorage area aptly characterizes the climate and seasons for a large part of the area:

"The four seasons are well marked in the Anchorage area, but in length and in some other major characteristics they differ considerably from the usually accepted standards in the States.

"Winter is considered to be that period during which the ponds, streams, and lakes are frozen; this period normally lasts 6 months, and extends from mid-October to mid-April. Periods of clear, cold weather normally alternate with cloudy, mild weather during the Anchorage winter. The average annual snowfall is 4½ feet, although the depth of snow on the ground seldom exceeds 15 inches. The amount of possible sunshine on the shortest day of the year is 5 hours and 28 minutes.

"Spring is the period immediately following the famed Alaska breakup. This season is characterized by warm, pleasant days and chilly nights; the mean temperature rises rapidly; precipitation amounts are exceedingly small.

"Summer comprises the period from June through early September, and is, in reality, two seasons of about equal length, the first of which is dry, the second wet. At the time of the summer solstice possible sunshine in Anchorage amounts to almost 19½ hours, and the sound of singing birds and pounding hammers is nearly as common at midnight as at noon. About the middle of July average cloudiness increases markedly, and the remainder of the summer is noteworthy for the frequency of rain. The wet portion of the summer usually accounts for about 40 percent of the annual precipitation.

"Autumn begins in early September and gives way to winter about the middle of October. The cloudy, rainy weather of early September changes abruptly, and the last two-thirds of the month is relatively free of cloudiness and precipitation."

The climate for this part of Alaska is comparable to many areas in the northern portion of the United States. This is illustrated by the following tabulation of average monthly temperatures for selected points in the subject area and the United States.

Average monthly temperatures

	January	February	March	April	May	June	July	August	September	October	November	December
Anchorage	13	19	25	35	46	54	57	56	48	36	22	14
Homer	23	27	28	36	42	49	53	53	47	39	29	23
Kenai	10	17	22	33	43	50	53	53	46	36	22	14
Seward	23	27	30	37	44	51	55	55	49	40	31	25
Whittier	25	28	28	35	44	52	57	56	49	39	30	26
Palmer	13	21	25	36	47	54	57	55	48	36	22	14
Spokane, Wash	27	31	40	48	55	63	73	68	59	48	38	30
Minneapolis, Minn	15	18	31	46	58	68	74	71	62	50	33	19
Bismarck, N. Dak	9	13	27	43	55	64	72	69	58	46	28	16

Extremes of temperature for two representative stations in the area are shown below:

Temperature extremes

	Maximum	Minimum
Anchorage	86	−38
Seward	88	−20

Monthly precipitation for a number of stations in the Kenai Peninsula-Anchorage-Matanuska area are shown in the following tabulation:

Average monthly precipitation

[Figures in inches of precipitation]

	Anchorage	Homer	Palmer	Seward
January	0.76	2.39	1.24	5.11
February	.58	1.40	.60	5.29
March	.60	1.64	.59	3.75
April	.40	1.33	.35	4.35
May	.51	1.00	.52	3.42
June	.89	1.07	1.59	2.40
July	1.55	1.66	2.20	2.90
August	2.56	2.89	3.24	5.97
September	2.71	2.79	2.90	9.72
October	1.87	3.74	1.56	10.83
November	1.00	2.55	.83	7.29
December	.84	2.76	.86	6.83
Normal, total	14.27	25.22	16.48	67.86

Population

Alaska's civilian population has exhibited a long-term trend of steady increases. The considerable fluctuations which have occurred in the total population have been due principally to the large number of military persons stationed in the territory in wartime. There are, however, seasonal fluctuations of civilian population due to normally greater employment in the summer.

The recent growth of civilian population and its seasonal fluctuations are illustrated in the following tabulation.

Alaskan civilian population

	Low, Jan. 1	Peak, Aug. 1	12-month moving average
1950 [1]	101,000	123,900	111,000
1951 [1]	112,000	140,900	123,000
1952 [1]	123,200	162,500	141,000
1953 [1]	142,000	174,300	155,000
1954 [1]	151,900	174,400	159,000
1955	[2] 154,900	[2] 172,400	[3] 168,000
1956	[2] 155,700		[3] 161,000

[1] Monthly Labor Review, U.S. Department of Labor, December 1955.
[2] "Estimate of Alaska Population," Rept. No. 4, Alaska Resource Development Board.
[3] U.S. Census Bureau estimate for July 1.

The military population of Alaska has varied from about 25,000 in 1950 to 50,000 in 1955. This can be compared to a peak of 150,000 military persons in 1943.

In the Kenai Peninsula-Anchorage-Matanuska Valley area the total population in 1950 (U.S. Census Bureau) was 39,412, of which over 9,000 (about 23 perecent) were military personnel. The ratio of males to females in the area was about 1.9 to 1. Population of the study area, by community, for 1950 is shown in the tabulation which follows this section.

It must be emphasized that since 1950 the population of the subject area has increased tremendously. The Anchorage Chamber of Commerce has estimated

that 95,000 persons resided in the Greater Anchorage area in 1955. Of these about 60,000 were civilians. The Anchorage City Planning Commission estimates that the 1956 civilian population was almost 64,000 persons in the Greater Anchorage area. The population of the total area in 1956 has been estimated to be in excess of 100,000, with about a third of these being military personnel.

The population of the territory differs significantly in certain characteristics from the average population in the States. In general, the Alaskans are younger and better educated. This is illustrated in the following comparisons prepared from 1950 census data.

[Years]

	Alaska	United States
Median age	25.8	30.2
Median school years completed (persons 25 years old and over)	11.3	9.3

Population of Kenai Peninsula, Anchorage, and Matanuska Valley Area, 1950 [1]

Community and area	
Anchorage area [2]	32,060
Anchorage City	11,254
Artesian Village	381
Eastchester Village	3,096
Eklutna Village	53
Girdwood Village	79
Kasilof Village	62
Kenai Village	321
Mountain View Village	2,108
Portage Village	34
Spenard Village	2,880
Woodland Park Village	94
Homer district	907
Anchor Point Village	65
Homer Village	307
Ninilchik Village	97
Palmer district	2,523
Eska Village	54
Jonesville Village	97
Matanuska Village	41
Palmer Village	890
Seward district	2,708
Cooper Landing Village	60
Hope Village	63
Moose Pass Village	70
Seward	2,114
Wasilla district	585
Wasilla Village	97
Whittier district	629
Whittier Village	627
Total	39,412

[1] Total population; includes military personnel on military installations.
[2] Includes small communities such as Tyonek and Skwentna Villages (total 1950 population of 190) on north shore of Cook Inlet.

Source: U.S. Department of Commerce, Bureau of the Census: "1950 Population—Alaska Report P–251, 1952."

SUMMARY OF ECONOMY

A. GENERAL

The present economy of the area considered in this presentation is primarily based on transportation, distribution, government and other services, and construction. This is illustrated in the following summary of 1955 employment statistics: [1]

	Percent of total employment
Government	28
Construction	10
Transportation	11
Wholesale and retail trade	10
Services	6
Others (fishing, food processing, mining, etc.)	35
Total	100

This type of economy reflects the strategic location of the area with respect to access to other parts of Alaska and the world. The important military bases in the area, including the headquarters of the Alaska Defense Command, contribute substantially to local economic activity, particularly regarding construction.

Anchorage is the hub of the area and contains the headquarters offices for many activities including a number of Government operations. It also contains the principal banks, stores, theaters, warehouses, hospitals, and similar facilities serving that vast section of the territory.

Agricultulture is important in the Matanuska Valley and is gaing in importance in the western part of the Kenai Peninsula.

The communities of the Kenai Peninsula are primarily based on fishing or transportation, with agriculture becoming increasingly important in the western section of the peninsula.

B. ECONOMIC STATISTICS

Assessed valuation for 1955 [1]

	Real property	Personal property	Total	Date of last evaluation
Anchorage	$78,767,390	$20,397,250	$99,164,640	1955
Palmer	3,469,788	1,786,847	5,256,635	1954
Seldovia	1,790,165	(2)	1,790,165	1954
Seward	5,853,044	2,426,865	8,279,899	1955
Total for Alaska	198,596,169	56,871,330	255,467,499	

[1] "Financial Data Regarding the Incorporated Towns and Cities of Alaska, 1955," Alaska Resource Development Board, April 1956.
[2] Not taxed.

Community indebtedness

	Total indebtedness	Percent of indebtedness to valuation
Anchorage	8,647,870	9
Palmer	None	
Seldovia	440,000	25
Seward	1,087,500	13

[1] See sec. 5, Labor Supply, for the detailed statistics which were the basis for this summary.

Wholesale and retail trade in 1954 [1]

	Anchorage	3d judicial district
Wholesale trade—sales:		
Merchant wholesalers	$22,340,000	$26,112,000
Other wholesalers	18,165,000	30,202,000
Total sales	40,505,000	56,314,000
Total establishments	53	84
Retail trade:		
Sales	$58,679,000	
Establishments	347	

[1] 1954 Census of Business, U.S. Department of Commerce.

C. PRESENT INDUSTRY

The industry of the Kenai Peninsula-Anchorage-Matanuska area is composed largely of facilities to make the area more self-sufficient. Under this classification is included extensive repair facilities for aircraft, rail equipment, construction equipment, and automobiles. Food processing and related operations are also important both for local consumption and for export. There are also mineral processing and lumber operations. In addition there is a variety of smaller repair and service operations.

A tabulation of some of the industries now located in the subject is shown below:

Food:
- Bakeries.
- Dairies.
- Fish canning.
- Jam and jelly manufacturing.
- Food freezing.

Mechanical repair:
- Aircraft repair.
- Contractor's equipment repair.
- Automotive repair.
- Railroad shops.

Construction:
- Premixed concrete.
- Concrete blocks.
- Concrete pipe.
- Sawmills.
- Contractors (all types).

Minerals:
- Coal mining.
- Chrome ore mining.
- Sand and gravel.

Miscellaneous:
- Mattress and furniture manufacturing.
- Oxygen, acetylene, carbon dioxide manufacturing.
- Laundry products manufacturing.
- Printing.
- Photofinishing (including color).
- Fur tanning and manufacturing.

LABOR SUPPLY

A. SEASONALITY AND UNEMPLOYMENT

Any consideration of labor supply in Alaska must recognize that there are seasonal fluctuations in its population and labor supply. This has been pointed out in the preceding section on population. These seasonal fluctuations also prevail in the Kenai Peninsula, Anchorage, and Matanuska area. The following data illustrate seasonality and unemployment of the labor force in the Anchorage Area for a number of recent years. (These data are based on the number of workers covered by unemployment insurance):

Comparison of minimum to peak employment

	Percent
Minimum month Jan. 1, 1956, to previous peak July 1, 1955	91
Minimum month Jan. 1, 1955, to previous peak July 1, 1954	82

Percent of total labor force unemployed

Period:	Percent
Jan. 1, 1956	10
July 1, 1955	7
Jan. 1, 1955	14
July 1, 1954	8

Although those unemployed and seeking employment in January 1956 included a large number of skills, over half of them were construction workers as shown by the following tabulation:

	Percent of unemployed
Laborers	16.6
Carpenters	15.5
Truck drivers	7.0
Heavy equipment operators	4.7
Other construction	15.5
Total of above	59.3

B. PRESENT EMPLOYMENT

The character of the labor supply in the subject area is shown in the following table from a June 1955 publication of the Alaska Territorial Employment Service entitled "Basic Economic Data." Although this table includes data for some areas adjacent to the study area, it well illustrates the makeup of the labor force of the Kenai Peninsula, Anchorage, and Matanuska Valley area.

Industry	Estimated 1955 employment	Average weekly hours	High employment periods
Fishing: [1]			
Food processing	[1] 4,055	48	May-August.
Fisheries	[1] 2,000	Open	Do.
Mining:			
Gold	100	54	May-November.
Coal	200	48	Do.
Petroleum	200	54	Do.
Other	130	54	Do.
Construction	3,000	48	Do.
Trade (wholesale and retail)	3,200	48	Stable.
Service	1,550	48	Do.
Finance, real estate, insurance	420	44	Do.
Transportation [1]	[2] 3,400	40	Do.
Communications and public utilities	290	40	Do.
Government	8,780	40	Do.
All others	3,850		
Total estimated area employment	31,175		

[1] Accurate figures not available as operation not underway at time of preparing the report.
[2] Includes Government-operated Alaska Railroad.

The Federal Government is the largest employer in Alaska, employing directly about one-fourth of the total civilian labor force. A large number of these Federal employees are in the Kenai Peninsula-Anchorage-Matanuska Valley area. The U.S. Department of Defense has a considerable number of civilian employees at military installations in the area. The U.S. Department of the Interior operates the Alaska Railroad and Alaska Road Commission with extensive facilities in the area. U.S. Department of Commerce employees are mainly employed in connection with the work of the U.S. Civil Aeronautics Administration.

C. WAGES AND RELATED BENEFITS

Wages and related benefits are considerably influenced by stateside wage standards, with adjustments made for the higher cost of living in Alaska. Seasonality of employment and past labor shortages have been historically important factors in increasing all wages. However, for year-round work at the present time wage scales are lower than for seasonal work, and the amount of year-round work is steadily increasing. This is due to improved engineering techniques for wintertime work and to a larger core of service industries. Wages in the Anchorage area can be compared in the following table prepared from data compiled by the Alaska Employment Security Commission.

D. UNIONS

There is a high degree of unionization in the area. Industries covered by unions include construction, canneries, fishing, coal mines, retail stores, restaurants, hotels, airlines, and the Alaska Railroad.

Wage and salary scales for selected occupations, Anchorage area, May 1955

[In dollars]

Occupation	Construction	Government	Trade and service
Professional and clerical (on a monthly basis unless otherwise indicated):			
Accountant	750–900	527–733	500–750
Bookkeeper	450–600	356–480	350–500
Clerk-typist	350–400	305	300–350
Draftsman			
Engineer	800–1,000	527–733	650–900
Salesclerk:			
Clothing		[1] 1.44	[1] 2.45–2.80
Grocery			[1] 2.45–2.80
Secretary	400–500	356	350–450
Stenographer, clerk-stenographer	400–450	330	325–400
Teacher, primary and secondary school		[2] 4,550–6,185	5,430–7,200
Technician, laboratory and/or X-ray		356	400
Service (on an hourly basis unless otherwise indicated):			
Baker	2.95		[3] 23.00
Butcher	2.70		3.00
Cook, camp	2.95	2.58–2.84	[3] 23.00
Dishwasher	2.15		[3] 14.00
Janitor and/or bull cook	2.15	2.78	[4] 400–500
Waiter and/or waitress	2.25	1.46	[3] 12.00
Trades and labor (on an hourly basis unless otherwise indicated):			
Brickmason	4.39		4.39
Bulldozer operator	3.74	2.95	3.54–3.74
Carpenter	3.69	2.84	3.00–3.69
Cement finisher	3.67–3.92		3.67
Crane-shovel operator	4.09–4.39	2.95	4.09–4.39
Electrician	4.35	3.02	4.35
Ironworkers, structural	4.035		
Machinist		3.14	3.50
Mechanic:			
Heavy duty	3.79	3.02	3.39–3.79
Maintenance		3.02	[4] 500–600
Painter	3.73	2.78	3.00–3.73
Plumber	4.25	2.95	4.25
Sheetmetal worker	4.10	3.02	4.10
Truckdriver:			
Light	3.39		2.75–3.22
Heavy	3.59	2.66	2.98–3.52
Welder	3.79–3.84	3.02	3.79–3.84
Laborer	3.255–3.29	2.22	3.25–3.29

[1] Per hour. [2] Per annum. [3] Per shift. [4] Per month.

TRANSPORTATION FACILITIES

A. GENERAL

Alaska's historical means of transportation to the territory has been by water. While water transport continues to be important for bulk shipments, air transport is used where time is important. A recently started combination of overland rail and truck service from the Middle West is now available, as well as overland truck service from the Pacific Northwest.

The Kenai Peninsula-Anchorage-Matanuska area is served by all methods of transportation. Those parts of the area not directly accessible to all-year water transportation are linked to the ports by all-weather highways and by the Alaska Railroad.

The following tabulation indicates the distance of Anchorage from selected points in Alaska and the United States. Rail and air distances are also summarized in tables on the inside of the front cover of this presentation.

Mileages from Anchorage

Place	Highway	Railroad	Airline	Place	Highway	Railroad	Airline
Point Barrow			820	Tok Junction	323		272
Big Delta	346		320	Whitehorse, Yukon Territory	726		567
Circle Hot Springs	608		332	Copper Center	202		164
Cordova			150	Portage	47	47	42
Fairbanks	438	356	262	Moose Pass	98	98	52
Fort Yukon			420	Coopers Landing	103		48
Girdwood	35	39	29	Kasilof	169		72
Homer	226		122	Clam Gulch	172		82
Juneau			571	Ninilchik	188		99
Kenai	163		63	Anchor Point	210		118
Ketchikan			805	Seattle	2,486		1,450
Kodiak			260	San Francisco	3,389		2,137
Kotzebue			712	Los Angeles	3,703		2,425
McKinley Park		234	180	Cairo (over the North Pole)			5,767
Nome			542	Cairo (via N.L.C. and London)			9,796
Palmer	48	48	35	Chicago			3,199
Seward	128	114	75	New York			3,860
Skagway			670	Washington, D.C.			3,616
Valdez	305		120	Miami			4,218
Glenallen Junction	189		164	Minneapolis			2,682
Gulkana	202		172				

B. WATER TRANSPORT

1. Ports

The principal civilian port of the Kenai Peninsula-Anchorage-Matanuska area is Seward. This port serves a large portion of the interior of Alaska by means of the Alaska Railroad and the highway system of Alaska. It is a year-round port of call for regular coastal vessels from Seattle, the west coast, and other ports of the world. Its facilities include an 800-foot railroad wharf (city dock), the slightly smaller San Juan dock, a 340-foot oil wharf, an 875-foot Army wharf, and a 175-foot cold storage plant wharf.

The port of Anchorage is usually closed to navigation from late November to the 1st of April because of ice conditions in the upper Cook Inlet and in Knik Arm. Although the waterway itself seldom freezes solid because of the 30-foot tidal range, navigation through the ice floes in the winter is made difficult especially for the approaches to dock facilities.

Present dock facilities include a 350-foot U.S. Army, Corps of Engineers' dock, a cement company wharf, a cannery wharf, and the wharf of a fish and farm products company. At present all these facilities have restricted depths at low tide. The port of Anchorage is actively engaged in planning an $8 million port improvement program to include new dock and warehousing facilities. The requisite bond issues have been authorized by the voters of the city. Also under study by interested groups in Anchorage is a major project for the construction of a causeway across Knik Arm. It is believed that—among many benefits—such a causeway would considerably reduce the effect of tides and floating ice which now constitute a hazard to navigation during the winter months. Thus, considerable thought is being given to providing Anchorage with a major, all-year-round port facility.

The extensive port facilities at Whittier are under military control and are not generally available for civilian use at the present time except for certain petroleum movements. A development, slated for the immediate future, however, contemplates a "sea train" dock to be available for civilian use. This sea-train facility will permit loaded rail cars to be "rolled off" from special ocean carriers and placed directly into service on the Alaska Railroad.

Other ports in the area are Homer and Seldovia, but their facilities are somewhat limited at present although constant attention is being given to improvement and expansion.

2. Transportation companies and schedules

Water transportation facilities to the area now include both steamship and oceangoing barge operations. The principal present operations serving the Kenai Peninsula-Anchorage-Matanuska area from the States are summarized in the following table:

	Summer	Winter
Seward:		
Coastwise Line	Every 12 days	Twice a month.
Alaska Steamship Co	Twice a week	Twice a week.
Alaska Freight Lines	do	Do.
Anchorage:		
Coastwise Line	On inducement	None.
Alaska Freight Lines [1]	Twice a week	Do.
Homer:		
Coastwise Line	On inducement	Do.
Alaska Steamship Co	Approximately 4 times between May and September.	Do.
Seldovia:		
Coastwise Line	On inducement	Do.
Alaska Steamship Co	Approximately 4 times between May and September.	Do.

[1] Barge operation.

The Coastwise Line operates steamships from Long Beach, San Francisco, Portland, and Seattle. The Alaska Steamship Co. operates steamships from Seattle. Alaska Freight Lines operates barges from Seattle. Both steamships and barges require about a week to travel between Seattle and Seward. Schedules are considered dependable by Anchorage wholesalers and are seldom hampered by adverse weather. Water transportation time and distances are summarized in a table on the inside of the front cover of this presentation.

3. Freight rates

Joint rates are available combining steamship and rail, steamship and truck, or barge and truck movements. The following table illustrates typical freight rates under a number of conditions. All figures are in dollars per hundredweight but do not include Seattle terminal charges or the 3-percent Federal transportation tax.

	From Seattle to—		
	Seward	Anchorage	Palmer
Class 2:			
Steamship and rail		$4.09	$4.47
Steamship and truck	[1] $2.47	4.57	5.07
Barge and truck		4.25	5.25
Class 4:			
Steamship and rail		3.00	3.27
Steamship and truck	[1] 1.80	3.90	4.30
Barge and truck		3.20	4.00

[1] Steamship rate to Seward when freight is to be transshipped by land at Seward. If ultimate destination is Seward, the rate is $1.55 per hundredweight or $0.77 per cubic foot, whichever is larger.

C. AIR TRANSPORT

Air travel is extremely important in Alaska for both freight and passengers. It has completely replaced the steamship passenger service to the Kenai Peninsula-Anchorage-Matanuska Valley area.

Nearly every community has either an airfield or a body of water suitable for aircraft landings. The following communities have airfields with a length of at least 4,000 feet: Homer, Kenai, Portage, Anchorage 3, Birchwood, Goose Bay, Palmer.

There are seven airlines providing scheduled air service in the Anchorage area. These are listed below:

Alaska Airlines, Inc.; Northwest Airlines, Inc.;[2] Cordova Airlines, Inc.; Northern Consolidated Airlines, Inc.; Pacific Northern Airlines, Inc.;[2] Reeve Aleutian Airways, Inc.; Scandinavian Airlines.

[2] Direct service to United States.

Airfreight rates to Anchorage from Seattle are $0.17 a pound for dry freight of over 100 pounds. Perishables are $0.18 a pound.

Air travel time and distances are summarized in the table shown on the inside of the front cover of this report.

Charter service operations within Alaska are widespread, embodying a large variety and unmber of aircraft. Helicopter service is also available from Anchorage.

D. RAIL TRANSPORT

The Alaska Railroad links the ports of Seward and Whittier to Anchorage, the Matanuska Valley, and Fairbanks. It is owned and operated by the U.S. Department of Interior. A recent $75 million rehabilitation program has modernized the line, including the addition of diesel engines.

Daily freight service is available from Seward and Whittier to Anchorage. Freight leaving Seward at 2:30 p.m. is at Anchorage by 7 p.m. of the same day. Frequent service is also available from Fairbanks to Anchorage, including overnight sleeping car accommodations.

Freight rates that are part of a joint water-rail movement are discussed in the foregoing section on water transport. In addition to these rates, the Railroad has several promotional rates designed to encourage the rail shipment of local products. Examples of these are the $0.28-per-hundredweight rate for vegetables moving from the Matanuska Valley to Anchorage, and the $2.31-per-ton rate for coal from the Jonesville mines in the Matanuska Valley to either Anchorage or Seward.

E. HIGHWAY TRANSPORT

Much of Alaska's highway construction has been accelerated by military requirements. Nearly all the communities in the Kenai Peninsula-Anchorage-Matanuska Valley area are linked by all-year highways. In addition, the area has year-round highway connections with the interior of Alaska, southeastern Alaska, and with the States and Canada via the Alcan Highway.

Leading south from Anchorage, a major highway crosses the Kenai Peninsula to connect with Seward. This highway connects with the Sterling Highway which crosses the Peninsula in an east-west direction and extends down the west side of Kenai Peninsula from Kenai to Homer.

North from Anchorage the Glenn Highway passes through the Matanuska Valley and extends in a northeasterly direction to Tok Junction where it joins the Alcan Highway to Canada, southeastern Alaska, and the States. Midway between the Matanuska Valley and Tok Junction, the Glenn Highway crosses the Richardson Highway, from which point direct routes lead north to Fairbanks and south to Valdez.

Electric Power

Most of the electric utilities in the Kenai Peninsula-Anchorage-Matanuska Valley area are publicly owned.

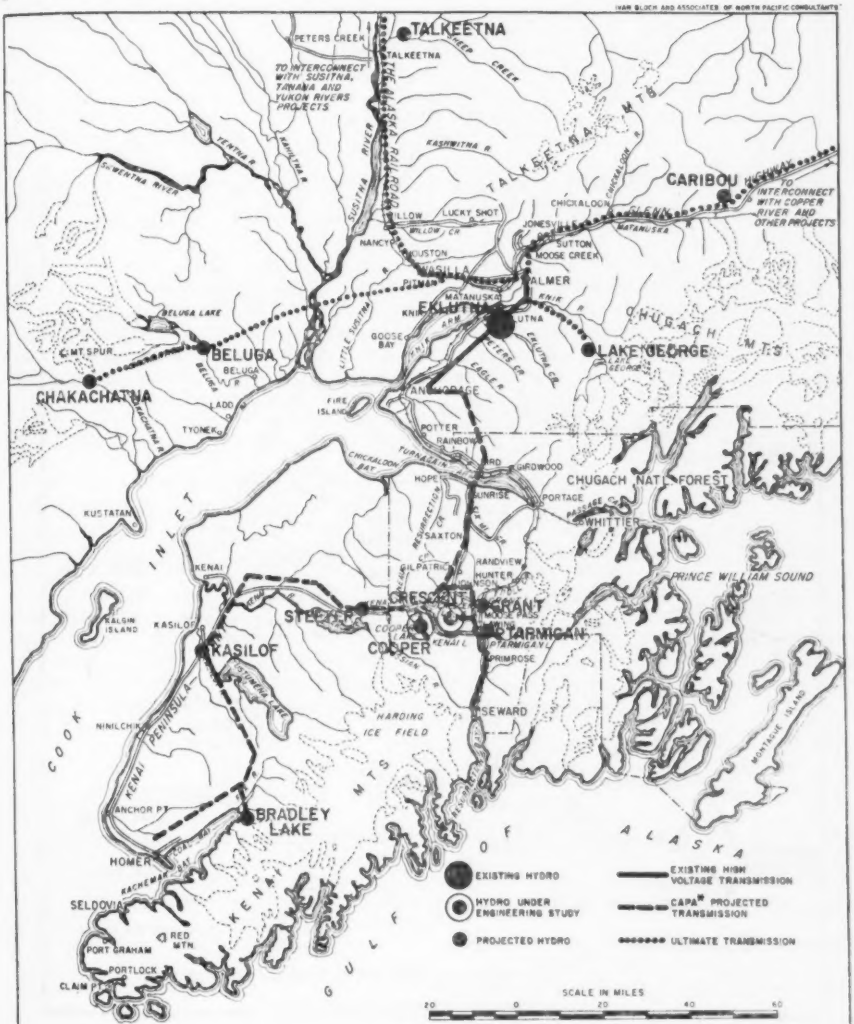
The principal facilities are described in the following table:

Name of utility	Service area	Source of power
Matanuska Electric Association (REA cooperative).	Matanuska Valley and Upper Knik Arm area as far south as Eagle River on east and Goose Bay on west.	5,000 kilowatts from U.S. Bureau of Reclamation Eklutna project.
Homer Electric Association (REA cooperative).	Western portion of Kenai Peninsula north of Kachemak Bay but excluding town of Kenai.	690 kilowatts [1] by diesel.
Chugach Electric Association (REA cooperative).	West of Knik Arm and north of Turnagain Arm from Eagle River to Portage but excluding the city of Anchorage.	3,250 kilowatts [1] by diesel; 9,500 kilowatts [1] by steam; 9,000 kilowatts from U.S. Bureau of Reclamation Eklutna project; 5,000 kilowatts steam unit under construction.
Kenai Lake Electric Association (REA cooperative).	Kenai Lake area and eastern portion of Kenai Peninsula but excluding the city of Seward.	100 kilowatts [1] by diesel.
City of Anchorage	City of Anchorage	6,736 kilowatts [1] by diesel; 16,000 kilowatts from U.S. Bureau of Reclamation Eklutna project.
City of Seward	City of Seward	2,830 kilowatts [1] by diesel.
Town of Kenai (privately owned).	Town of Kenai	140 kilowatts [1] by diesel.

[1] Installed capacity.

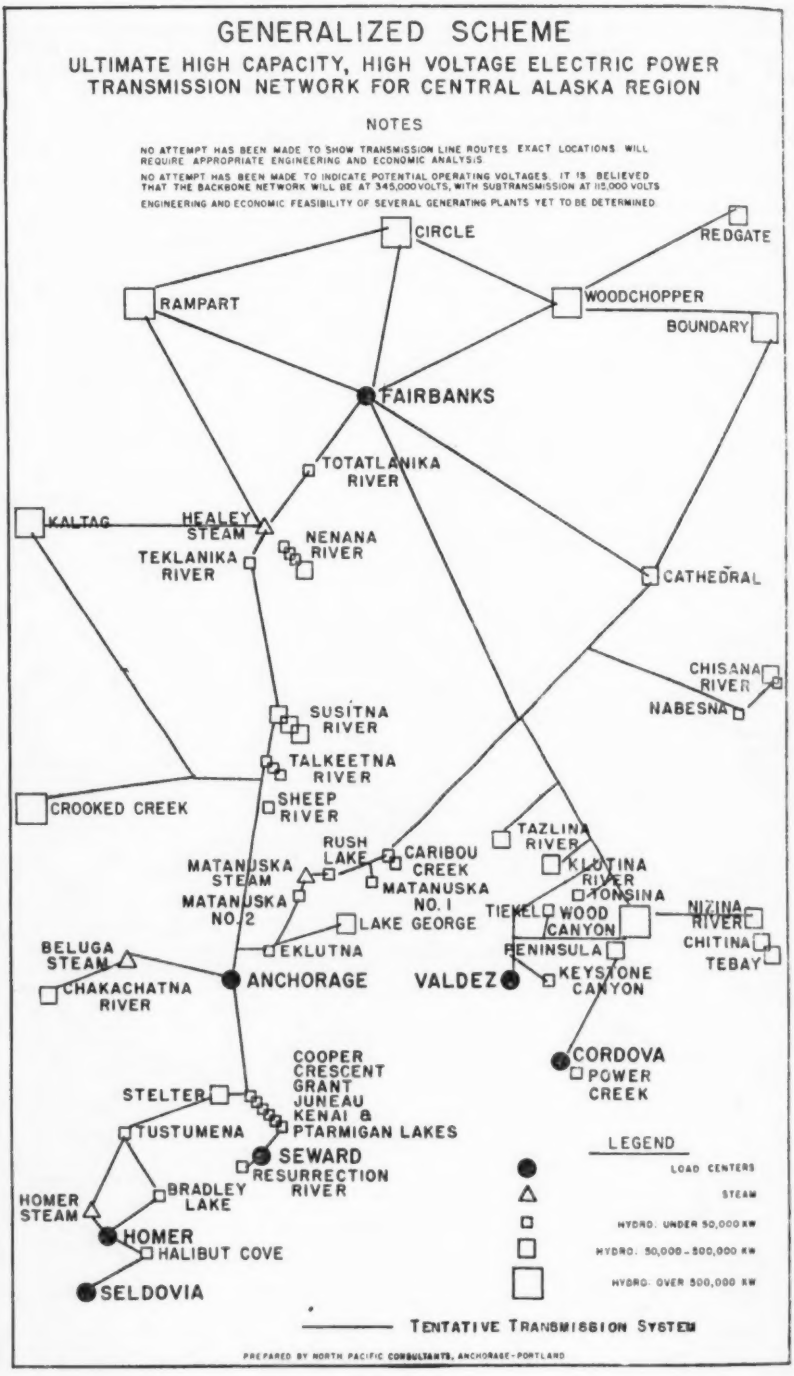
In addition, there is a diesel installation at Whittier operated by the military and a steamplant at Fort Richardson.

The Central Alaska Power Association (CAPA) is an organization composed of a number of the above utilities. The purpose of CAPA is to provide a regional generation-transmission system to integrate and expand the area's power systems, and to permit group development of the hydroelectric and thermal-electric resources of the area. At the present time all the electric associations are members of the CAPA and the municipally owned systems have been invited to join. The attached map of the Kenai Peninsula-Anchorage-Matanuska Valley hydroelectric system outlines the proposed generation-transmission system of CAPA. Additional integration with a much larger portion of central Alaska is considered to be reasonable. Such a system would entail a high-capacity, high-voltage transmission network linking the Anchorage-Kenai Peninsula-Matanuska area with the Copper River area, the Fairbanks area, the proposed Yukon River projects as well as certain potential large-capacity mine-mouth coal-fired steam electric plants. A schematic diagram of such a system is shown in the attached plate.



KENAI PENINSULA - ANCHORAGE - MATANUSKA VALLEY HYDROELECTRIC SYSTEM

*CENTRAL ALASKA POWER ASSOCIATION INC.


GENERALIZED SCHEME
ULTIMATE HIGH CAPACITY, HIGH VOLTAGE ELECTRIC POWER TRANSMISSION NETWORK FOR CENTRAL ALASKA REGION
NOTES
NO ATTEMPT HAS BEEN MADE TO SHOW TRANSMISSION LINE ROUTES. EXACT LOCATIONS WILL REQUIRE APPROPRIATE ENGINEERING AND ECONOMIC ANALYSIS.
NO ATTEMPT HAS BEEN MADE TO INDICATE POTENTIAL OPERATING VOLTAGES. IT IS BELIEVED THAT THE BACKBONE NETWORK WILL BE AT 345,000 VOLTS, WITH SUBTRANSMISSION AT 115,000 VOLTS.
ENGINEERING AND ECONOMIC FEASIBILITY OF SEVERAL GENERATING PLANTS YET TO BE DETERMINED.
CIRCLE
REDGATE
RAMPART
WOODCHOPPER
BOUNDARY
FAIRBANKS
TOTATLANIKA RIVER
KALTAG
HEALEY STEAM
NENANA RIVER
TEKLANIKA RIVER
CATHEDRAL
CHISANA RIVER
NABESNA
SUSITNA RIVER
TALKEETNA RIVER
CROOKED CREEK
SHEEP RIVER
TAZLINA RIVER
RUSH LAKE
CARIBOU CREEK
KLUTINA RIVER
MATANUSKA STEAM
MATANUSKA NO. 1
TONSINA
MATANUSKA NO. 2
TIEKEL
WOOD CANYON
NIZINA RIVER
LAKE GEORGE
CHITINA
BELUGA STEAM
EKLUTNA
PENINSULA
TEBAY
CHAKACHATNA RIVER
ANCHORAGE
VALDEZ
KEYSTONE CANYON
CORDOVA
POWER CREEK
COOPER
CRESCENT
GRANT
JUNEAU
KENAI &
PTARMIGAN LAKES
STELTER
TUSTUMENA
SEWARD
RESURRECTION RIVER
HOMER STEAM
BRADLEY LAKE
HOMER
HALIBUT COVE
SELDOVIA
LEGEND
LOAD CENTERS
STEAM
HYDRO. UNDER 50,000 KW
HYDRO. 50,000 - 500,000 KW
HYDRO. OVER 500,000 KW
TENTATIVE TRANSMISSION SYSTEM
PREPARED BY NORTH PACIFIC CONSULTANTS, ANCHORAGE - PORTLAND

The Kenai Peninsula-Anchorage-Matanuska area has a number of important hydroelectric possibilities. These are summarized in the table which follows:

[Estimated installed capacity in megawatts]

Area and plant description	
Matanuska Valley-Anchorage area	207–284
Matanuska River No. 1	18
Matanuska River No. 2	15
Caribou Creek No. 1	17–24
Caribou Creek No. 2	
Rush Lake	7
Lake George	120–190
Eklutna Lake [1]	30
Kenai Peninsula	171–196
Cooper Lake [2]	15
Crescent Lake [3]	10
Ptarmigan Lake	5
Grant Lake	6
Juneau Lake	8
Kenai Lake	25–40
Stelter Ranch, Kenai River	33
Kasilof River	24
Bradley Lake	46
Halibut Creek	9

[1] In operation.
[2] Detailed engineering report has been prepared under the auspices of CAPA. Construction to start in 1957.
[3] Engineering studies underway by city of Seward.

The outlook for power costs on potential hydroelectric projects in the Kenai Peninsula-Matanuska Valley area range from 3 to 11 mills per kilowatt-hour. One of the lowest cost proposed projects is the Lake George project northeast of Anchorage, which would utilize a large glacier as a dam. Considerable investigation of this novel scheme indicates that power might be available at 3 mills at the proposed powerhouse about 50 miles from Anchorage. Bradley Lake, at the head of Kachemak Bay, also offers unusual possibilities. Present Government studies indicate that power costs might be between 3 and 4 mills. Most of the other Kenai Peninsula power projects involve estimated power costs ranging from slightly over 5 mills (for Cooper Lake) to around 11 mills per kilowatt-hour.

It should also be noted that the Chugach Electric Association is currently and actively sponsoring the establishment of a nuclear reactor powerplant of 10,000 kilowatts in conjunction with the U.S. Rural Electrification Administration and the U.S. Atomic Energy Commission. This plant will probably be located in the Anchorage area.

Also under consideration are two mine-mouth steamplants to feed electricity into the area's grid system. One of these would be in the Matanuska Valley utilizing the valley's coalfields. The other location would be west of Anchorage, across Knik arm in the vicinity of the Beluga coal deposits (Beluga River area), assuming reserves and mineability are favorable. Some thought has been given to the similar utilization of coal reserves in the Homer area.

Fuels

A. COAL

1. General

Coal is found in a number of areas in Alaska. The most extensively worked beds are in the Matanuska Valley and the Nenana fields near Healy on the Alaska Railroad between Fairbanks and Anchorage. Other fields occur in the Yukon Basin, along the Susitna River (northwest of Anchorage), on the Kenai Peninsula, and in numerous other areas.

Since much of the available information has been only obtained from reconnaissance surveys, it is difficult to make detailed estimates of the total reserves or their mineability in Alaska. An idea of the order of magnitude of these reserves, however, can be obtained from the following table:

Coal reserves of Alaska [1]

[Millions of short tons]

Region	Lignite and subbituminous	Bituminous	Anthracite
Northern Alaska and Seward Peninsula	60,000	22,000	
Yukon Basin	5,800	20	
Cook Inlet-Susitna	3,000	1,500	3
Southwestern Alaska	600	100	
Copper River-Alaska Gulf		1,100	2,100
Southeastern Alaska	5		

[1] From "Analyses of Alaska Coals," Technical Paper 682, U.S. Department of Interior, Bureau of Mines, 1946.

2. Matanuska coal

Matanuska coal is extensively used in the Anchorage area. Largest consumers include the steam-electric plant at Fort Richardson and the steamplant of the Chugach Electric Association in Anchorage.

The present cost of coal at Anchorage is $13.90 per ton. Net cost at the Jonesville mining operation is $11.55 and the cost of transportation is $2.35 (includes transportation tax).

The contract analysis of the coal supplied to the Chugach Electric Association is as follows:

Moisture	8 percent	maximum.
Ash, dry	12 percent	maximum.
B.t.u	11,546.	
B.t.u., dry	12,550.	

A typical proximate analysis of this coal is as follows:

	Percent as received	Percent dry basis
Moisture	7	
Ash	11	12
Volatile	37	39
Fixed carbon	45	49
Total	100	100
B.t.u	11,707	12,630
Sulfur	0.25	0.27

3. Kenai Peninsula coal

Numerous exposures of coal are reported in the Homer area and some mining has been carried on at different times. The development of modern mines, though, will probably be dependent upon a thorough exploratory drilling program to establish the extent of the minable reserves.

Two samples taken from the area were analyzed as shown in the following tabulation. These analyses were reported in the Bureau of Mines publication "Investigation of Coal Deposits in South Central Alaska and the Kenai Peninsula" (R.I. 4520, May 1949).

		As received	
		1st sample	2d sample
Moisture	percent	24.2	16.5
Volatile	do	34.9	30.3
Fixed carbon	do	33.1	41.1
Ash	do	7.8	12.1
Sulfur	do	0.3	0.4
B.t.u.'s		8,490	9,020

B. OIL

The Kenai Peninsula area receives its oil by ocean tanker and distribution is made by truck and rail. The price of oil at various communities in February 1956 was as shown below:

	Cost per gallon			
	Anchorage	Homer	Seward	Palmer
PS 100 or grade 1	$0.198	$0.174	$0.174	$0.206
PS 200 or grade 2:				
As diesel fuel	.236	.209	.212	.244
As furnace fuel	.186	.159	.162	.194
PS 300	.111	----------	.087	----------

C. OTHER FUELS

There are no other fuels used in the subject area in significant quantities, but extensive drilling and exploration is being actively carried on or planned for immediate commencement by nearly all of the major oil companies and others for oil and gas in the Cook Inlet area and the Matanuska Valley.

Water Supply

Those communities with public water systems are generally operating at capacity at the present time.

The city of Anchorage operates a municipal system mainly based on the Ship Creek drainage as a water source. This source is both limited in quantity and has high turbidity in the spring. For this reason the city is expanding its system by means of deep wells. Industrial water rates for Anchorage are determined on an individual consumptive basis.

Analyses of water supplies are not available for most communities. Either ground water or surface water is available for industrial use at most communities but will probably have to be developed by consuming industry. Almost all the surface water streams and lakes in the subject area become very turbid during the spring breakup. This turbidity may be alleviated by simple filtering. The dissolved mineral content of most surface water supplies is very low.

Air and Water Pollution

Regulations concerning air and water pollution are not extensive in Alaska. The U.S. Fish and Wildlife Service maintains policing action in order to protect fish-producing areas and streams.

The city of Anchorage, in its zoning ordinance, has some restrictions on industries which might produce air pollution. These regulations are as follows:

A. USES PERMITTED: LIGHT INDUSTRIAL DISTRICTS

24. "Other uses similar to the above, provided that they are not objectionable to nearby property by reason of odor, dust, smoke, fumes, gas, * * *."

B. USES PROHIBITED: HEAVY INDUSTRIAL DISTRICTS

2. "All uses that may be noxious or injurious by reason of the production or emission of dust, smoke, refuse matter, odor, gas, fumes, noise, vibration or similar substances or conditions: *Provided, however,* That any uses may be permitted if approved by the Board of Adjustment and subject to the securing of a permit therefor and * * *."

Sewage disposal in many parts of the subject area is easily solved by discharging the sewage directly into tidal bodies. At Anchorage, for example, no municipal sewage treatment facilities are used or contemplated. Sewage is piped some distance out into Knik Arm where the extreme tides and rapid currents disperse and carry away the effluent. This procedure is considered to be satisfactory at the present time and is also included in the long-range plans for Anchorage.

Living Conditions

A. HOUSING FACILITIES

Construction in the Anchorage area has been at a high level over the past several years in an effort to solve the housing shortage. At the present time houses, apartments, and trailers can be obtained. House and apartment rentals range between $125 and $200 a month. Most are unfurnished. The cost of a five-room completely modern house would average from $12,000 to $18,000.

B. COST OF LIVING

The cost of living in the Anchorage area is probably about 40 percent more than in the States. The U.S. Department of Labor in a 1951 study gave Anchorage a cost of living index of 140 compared to 100 in Seattle. At the present time the Department of Interior provides its employees in the Alaska Railroad with a 45-percent cost of living increase over stateside wages. Civilian employees of the military receive a 25-percent oversea allowance.

Much of the increase is due to the cost of transportation from stateside suppliers. Although in the past the cost of wholesaling in Alaska was considerable for many commodities, recent studies indicate that this function is comparable in cost to stateside operations. Other costs are gradually coming down, too. Anchorage received a cut in fire insurance rates in 1955 when it obtained a fourth-class rating. Improved transportation facilities will further reduce the cost of many materials. Decreasing the seasonality of employment will reduce the cost of wages and the cost of many services.

C. MEDICAL FACILITIES

The major private hospital in the Kenai Peninsula-Anchorage-Matanuska Valley area is the 90-bed Providence Hospital in Anchorage. It is completely modern in every respect. The U.S. Department of the Interior has recently opened a new 400-bed Alaska Native Service Hospital in Anchorage. The military also maintains its own complete facilities in the Anchorage area.

D. SCHOOLS

The largest school system of the area is the Anchorage independent school system. This system contains a high school, a junior high and eight elementary schools. A new $2¼ million high school was opened in 1955 and is as modern as any new school in the States. A community college now serves the area and plans are underway for the construction of a $2 million liberal arts college by the Methodist Board of Missions.

Modern schools are also found in the smaller communities of the area. The greater part of these facilities has been constructed or remodeled in the last few years.

E. CHURCHES

A 1956 listing of Anchorage named 51 churches representing nearly every denomination. The smaller communities also have a variety of religious representations. Community churches are found in several locations.

Plant Sites

A. GENERAL

Almost all of Alaska's land is in Federal ownership with over 90 percent of the territory's land under the jurisdiction of the U.S. Department of the Interior. A major portion of the land is open to the establishment of homesteads, homesites, manufacturing sites, or mining sites. Land is also available on lease for grazing animals and for fur farms. Timber on vacant, unreserved public land is sold on a stumpage basis.

In many parts of the Kenai Peninsula-Anchorage-Matanuska Valley area land has been converted to private ownership. In this area land is available from a number of agencies and is available in nearly every community. Many of the desirable sites are owned by the Alaska Railroad [1] and are available by lease. Terms of lease is now 55 years.

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[1] Offices in Anchorage.

Public domain lands, outside of certain specific reserves (for moose, military use, national forest, etc.) are available for sale from the U.S. Bureau of Land Management.[1] Up to 80 acres is allowable per applicant at the rate of $2.50 per acre for trade and manufacturing sites. Only acreage actually to be occupied will be sold.

Territorially administered school land is available for lease for industrial purposes. Length of lease is 10 years but there is automatic renewal if the development has been deemed sufficient.

Private land is available for sale in most communities.

B. ANCHORAGE

A zoning ordinance is in effect in the city of Anchorage. This ordinance limits heavy industry to the area adjacent to Ship Creek at the north of the city. This area contains the railroad yards and various sidings. A major portion of this land is owned by the Alaska Railroad. It is largely occupied by various wholesale distributing facilities. The railroad reports that none of its land is available for lease in this area in 1956. The railroad charges for land ranges from 0.2 to 5 cents per square foot per year.

The city of Anchorage has indicated that there is a total of 145 acres zoned for heavy industry. Of this amount 52 acres is vacant, but much of this land is in small parcels. Part of the vacant land is presently without a public water supply.

The city has zoned 215 acres for light industry of which 144 acres was vacant in 1956. The area for light industry is mainly adjacent to the heavy industry zone and along the Glenn Highway northeast of Anchorage. Part of this area is school owned and is only available by lease. About 50 acres of the total are south of Anchorage along Chester Creek. This latter is about half occupied. Railroad facilities are not available to the light industry zone.

In the vicinity of Anchorage there is considerable private land that could be made available to industry. Rail facilities not now directly available to these potential areas could be extended by spur lines.

C. MATANUSKA VALLEY

In the Palmer area the Alaska Railroad owns a right-of-way strip 100 feet on each side of its tracks. At Matanuska there are about 200 acres adjacent to the tracks in the railroad reserve. This land is presumably available for lease for industrial purposes. Since this area is primarily agricultural in economy there would probably be no shortage of private land available for industrial purposes.

D. KENAI PENINSULA

Whittier is primarily a military port. The small amount of railroad land that might be available in the Whittier area will probably be absorbed by the military. Private land suitable for industrial development is scarce in the vicinity of Whittier.

Seward has no railroad land available for industrial purposes. There is considerable private land available on Resurrection Bay that would be suitable for industry. There are a number of year-round streams passing through the area. Rail facilities are not presently available to much of this land.

Moose Pass has a 4-acre site between the railroad and Upper Trail Lake which is owned by the railroad and is available for industrial lease.

Homer and Seldovia both have areas adjacent to dock facilities which could be used for industrial purposes. The Homer Spit offers a considerable plant site area but there might be some difficulty in securing large quantities of fresh water. Near Homer, on Kachemak Bay, there are a number of sites that combine streams for water supply with access to ocean transportation.

TAXES

A. FEDERAL

Alaskan residents and industries pay all the Federal taxes that they would normally pay in the States.

B. TERRITORIAL

All individuals and corporations subject to Federal income tax must also pay a territorial income tax equivalent to 12½ percent of the Federal income tax.

A business license is required for all businesses except manufacturers and wholesalers. The business license fees are as follows:

Initial fee: $25.

Gross receipts under $20,000: Covered by initial fee.

Gross receipts between $20,000 and $100,000: one-half of 1 percent of excess over $20,000.

Gross receipts over $100,000: $400 plus one-fourth of 1 percent of excess over $100,000.

In addition, all employed persons pay an annual $7.50 territorial school tax. Unemployment compensation taxes in the territory are similar to most States. Each employer of one or more persons contributes 2.7 percent on the first $3,600 earned by each employee. The employee contributes one-half of 1 percent.

C. LOCAL

Taxes on real and personal property vary by community. These taxes are for the support of schools and municipal operations. The following list indicates the range of local taxes among the communities of the subject area.

	Personal property tax	Real property tax	Sales tax
	Mills	*Mills*	*Percent*
Anchorage [1]	20	20	None
Palmer	16	16	2
Seldovia	None	13	2
Seward	26	16	2

[1] 10 mills to city, 10 to school.

Mineral Resources

It is known that the Kenai Peninsula-Matanuska Valley area is well mineralized. Mining emphasis has been principally directed toward gold, coal, and chromite, with large scale exploration now underway for petroleum and natural gas. The geological literature indicates at least the existence of: chromite, clay, coal, copper, gold, granite, gypsum, lead, limestone, molybdenum, platinum, and tungsten. As geological exploration and mineral prospecting continues in the area, other industrial minerals are likely to be discovered but at this time it would be highly speculative to hazard estimates of what these might be.

Chromite, coal, limestone, and construction materials are the materials on which available information provides a basis for the initial analysis of industrial opportunity.

As pointed out in the foregoing section of "Fuels," the Matanuska coal fields are now being exploited to provide coal for the area. Minable reserves are believed to be substantial but additional development work will be required. Possibilities of consolidation of adjacent coal properties for large-scale, long-term operations have been restricted by the application of existing leasing regulations but these are in process of revision. In the Homer area, substantial coal reserves have been known but due to a lack of specific interest, relatively little work has been done to develop detailed information on minability and utilization. The Beluge coalfields, west of Anchorage across Cook Inlet, appear to be large and of such general disposition as to facilitate strip mining. However, substantial exploration to depth will be required.

In the instance of both the Homer and Beluga coalfields, study will be required of the most suitable mining methods for various seams. As a source of carbon for metallurgical processing (as for ferrochrome, other electric furnace alloys, calcium carbide and the like) these coals will require specific analysis as to their suitability and possible beneficiation requirements.

Regarding chromites in the Seldovia district (across Kachemak Bay from Homer) the reserves are large. The high-grade lump ore has been known to be the only source of such ore within the confines of the United States. During the past 3 years, active mining of the higher grades has been underway for Government stockpiling purposes. It is certain that there exist substantial quantities of chromite susceptible to concentration, beneficiation, and processing.

A 50-ton-a-day chrome mill has recently been built on Red Mountain near

Seldovia. The mill will concentrate ore on a year-round basis. Ore will be stockpiled on the beach for conveyor loading on barges.

Limestones of Kachemak Bay have been investigated from time to time as a possible raw material source for cement manufacture. Tonnage estimates indicate that sufficient quantities can be located for industrial purposes but analysis will be required to determine suitability for chemical and related usage.

Sand and gravel deposits are plentifully available in all areas. Shale for the production of lightweight aggregate is found in the Matanuska Valley. Pumice and pumicite occurs in Katmai National Monument at the entrance of Cook Inlet. Materials suitable for the production of rock wool are found in the Anchorage area (Potter limestone and argillite) and in the Homer-Seldovia area (Seldovia limestone and Homer clay). Clay for bricks and other building products is found on Knik Arm near Anchorage and on Kachemak Bay near Homer.

Obviously, in the event commercial quantities of petroleum and natural gas are found in the area, the possibilities of industrial utilization include fuel, recovery of carbon in refinery operations, and raw stock for chemical industry.

Forest, Agriculture, and Fish Resources

A. FOREST

A wide variety of forest species—coniferous and deciduous—are found in the Kenai Peninsula-Anchorage-Matanuska Valley area. In the Anchorage and Matanuska Valley area, the predominant species are white birch, white spruce, balsam poplar, aspen, and cottonwood. In the extreme southern tip of the Kenai Peninsula on Kachemak Bay in the Seldovia area are stands of hemlock and spruce. These same species are also found in the Chugach Range lowlands from Skilak Lake northward to Turnagain Arm and eastward to Prince William Sound, and along the northeastern shore of Turnagain Arm. Throughout the entire area, in its wet lowlands, black spruce predominates.

Commercially, the hemlocks and spruce of the Kenai Peninsula and the spruce-birch stands of the Anchorage-Matanuska-Susitna valleys present interesting possibilities. Small sawmills are scattered throughout the entire area producing lumber for local use.

South and east of Talkeetna, along the Susitna River and the Alaska Railroad, is an area of 105,000 acres which is designated by the Bureau of Land Management as the Talkeetna birch stand. This area has had a negligible amount of logging and consists of dense stands of solid even-aged birch and some white spruce saw timber. The birch offers possibilities for pulp, furniture stock, veneer, and saw timber. (See sec. 16.)

Following is a summary of the estimated timber volumes in this stand.

Commercial birch type	acres	[1] 73, 191
Other forest types	do	19, 866
Nonforest types	do	[2] 11, 502
Total acreage	do	104, 559
Gross commercial volume, birch	M board feet	[3] 146, 000
Net commercial volume, birch	do	[4] 92, 000
Gross commercial volume, white spruce	do	14, 345

[1] All forest type associations containing a predominance of commercial birch.
[2] Includes muskegs and open water.
[3] An additional amount equivalent to about 35 percent of the gross commercial volume contained in noncommercial trees.
[4] Gross volume less 37 percent cull.

B. AGRICULTURE

Three principal areas contain substantial acreage of lands either now under agriculture or believed suitable for that purpose. These are the Matanuska Valley, along the west coast of the Kenai Peninsula and in the Susitna Basin adjacent to Cook Inlet and Knik Arm. Various Federal agencies have estimated the extent and suitability of these acreages. In the Matanuska Valley, for example, it is believed there are 59,000 acres of potential cropland and 153,000 acres suitable for grazing. On the Kenai Peninsula, 155,000 acres are thought possible of utilization for crops, and 132,000 acres for grazing and pasture. The Susitna Basin is estimated to contain from 90,000 to 100,000 acres of potentially suitable agricultural lands.

In 1954, some 10,000 acres were under cultivation in the Kenai Peninsula-Anchorage-Matanuska Valley area and more is being added each year. This amount represents 78 percent of Alaska's total cultivated land. In 1954, it was estimated that the total value of commercial production from these 10,000 acres was close to $2 million per year, with dairy products and potatoes representing the major portion of production and value.

Expansion in the utilization of suitable lands and in the production of agricultural commodities is assured as the economy of the area continues to diversify and grow. Continued study of advanced agricultural practices by both private and public agencies are laying a firm foundation for substantial gains in this sector of the area's activities, and for the production of a wide variety of agricultural commodities of interest to the industrial processor.

C. FISH

The salmon fisheries on Cook Inlet and Prince William Sound continue to be important to the area's economy. Important species, abundantly found in the waters of the Gulf of Alaska in proximity to the Kenai Peninsula, include red, king, cohoe, pink, and chum salmon; halibut; herring; cod; clams; shrimp; and more recently Alaska king crab. There are other species, particularly so-called bottom fish, in which commercial activity is likely to develop with the passage of time. A large quantity of fisheries wastes, including possibly such material as crab shells, might be susceptible to processing as meal for fertilizer, cattle feed supplement, and other purposes.

Some Industrial Possibilities

(Note.—The following is included on an exemplary basis only as to type of industrial possibilities which may exist in the area of this presentation. Considerably more analysis may be required to reveal the ultimate feasibility of these or other possibilities.)

A. METALLURGICAL

The potential combination of low-priced hydroelectric power from the Bradley Lake site and its eventual interconnection with the Central Alaska Power Association generation-transmission system, together with the chromite ores, limestone, coal, and possibly silica in—or tributary to—Kachemak Bay might provide the opportunity for the establishment of an electrometallurgical plant for the production of alloys (especially of the exothermic type), and calcium carbide.

The production of ferrochrome, related alloys, and calcium carbide might be accomplished in that area by means of electric furnace operations. Such furnaces may be designed and operated interchangeably for the production of these different materials. In the case of ferroalloy production, the charge to the furnace would consist of chrome ores or concentrates, fluxing material (limestone) and carbon in proportions commensurate with the analyses of available materials and the end-products desired. For calcium carbide, the charge into the furnace is high-purity limestone and carbon, also in proportions depending on the analyses of the input raw materials. Although coke is the form of carbon usually selected, coal chars, charcoal, and wood chips can also be utilized.

The feasibility of operation of such a combination electric furnace installation can only be determined by a detailed analysis of raw materials suitability (based upon specifications which are ordinarily highly selective); the economics of raw materials mining, beneficiation, and transportation to the plant site; the economics of processing (taking into consideration processing techniques, capital costs, and operating costs such as labor, water, fuel, power, etc.); and factors relating to consuming markets (including size and location of markets, and the costs of reaching these).

Without the detailed analyses mentioned above, feasibility cannot be judged. However, on a broad initial basis, the combination plant operation suggested above warrants consideration due to the seemingly favorable availability of power, chromite ores, limestone, coal, and deepdraft transportation. Furthermore, the possibility of shifting production from ferrochrome and related alloys to calcium carbide, or vice versa, may be unusually applicable to an Alaskan plant so as to meet fluctuating conditions in markets for output materials and in operating conditions in the mining and beneficiating of input raw materials. local domestic and Pacific Basin markets for both ferroalloys and calcium carbide will warrant consideration.

B. CHEMICAL

The successful operation of a small ammonium nitrate plant in Iceland, utilizing a large proportion of its power input on an "offpeak" basis, has suggested a similar type of operation for the Kenai Peninsula-Anchorage-Matanuska Valley area.

The process which has been under preliminary consideration would entail the following: Production of nitrogen by fractionation of liquid air (by compression-cooling of air); production of hydrogen by electrolysis of water; production of ammonia by medium pressure synthesis from nitrogen and hydrogen; catalytic oxidation of ammonia and nitric acid; production of ammonium nitrate by low temperature crystallization.

By using on the order of 3,000 kilowatts of firm power and around 13,000 kilowatts of "offpeak" power, such a plant could produce some 30 tons of ammonia per day and approximately 70 tons of ammonium nitrate per day. On the basis of very preliminary cost estimates, ammonium nitrate could be produced for about half the present delivered prices of the material in the area. More comprehensive analysis, however, is required on these various estimates.

Markets for the output of such a plant would include the growing—even though yet minor—requirements of the territory's agriculture, and exports to the Orient and portions of the west coast. Considerably more study of these markets is required, especially as to competitive relations with existing production.

It is also possible that some markets for locally produced ammonia and chemical derivatives might be developed upon further study and analysis.

C. FOREST

As pointed out previously, there exist large stands of birch, other hardwood species and spruce in the Knik Arm-Matanuska-Susitna area. Interest has often been expressed in the utilization of the birch for shipment as veneer and furniture stock. However, there appears to be another possibility which would provide for greater utilization of these species and for economies in the potential harvesting of logs for this use.

Under investigation at this time is the feasibility of a logging operation in combination with a specialized small capacity pulp mill. It is known that hardwood species, and birch in particular, provide a pulp especially desirable for admixture with softwood pulps so as to increase softness and strength of such paper products as toilet tissues, as well as for adding desirable physical qualities in the manufacture of such products as corrugated and container boards. The logging operation would, of course, make possible the selection of high-grade birch logs for veneer on a basis which would greatly increase economic feasibility.

APPENDIX NO. 13

Chapter 135, Session Laws of Alaska, 1960

An Act To establish a Section of Power Development within the Department of Commerce; defining its authority and duties; and providing for an effective date

(C.S.S.B. 203)

Be it enacted by the Legislature of the State of Alaska:

SECTION 1. *Findings and Affirmation of Purpose.* The Legislature, recognizing that Alaska has vast hydroelectric and other power resources whose early development is vital to its industrialization, economic growth, and general well being, and in view of the unavailability of similar undeveloped resources elsewhere in the United States to meet the ever increasing demands for electric power and energy, that such development is likewise a matter of national interest and security, hereby finds the expeditious development of such resources to be of primary state interest. The Legislature further ratifies and affirms the findings and declaration of legislative purpose set forth in Sec. 1, Ch. 122, SLA 1959.

SEC. 2. *Section of Power Development: Purposes.* There is hereby created within the Department of Commerce a Section of Power Development hereafter referred to as the "section" for the purpose of conserving, developing, and utilizing the water and other electric power resources of Alaska, of making an

abundant supply of electric power and energy available to the people of Alaska at the lowest possible rates compatible with sound business principles, and of promoting and extending the use of electric power and energy in Alaska for industrial, agricultural, commercial, residential, and other purposes.

SEC. 3. *Duties.* It shall be the duty of the section:

(1) To study Alaska's waters, fossil fuel, and other power resources and to collect and disseminate information relating thereto.

(2) To compile and maintain a complete and current inventory of electric generation, transmission, and distribution facilities in Alaska insofar as such facilities are utilized to furnish central station electric service, but including all other such facilities which may, in the opinion of the section, significantly influence or affect the development of electric power resources or the use or need for existing or additional electric power facilities.

(3) To study existing and potential uses and markets for electric power and energy and to promote and otherwise encourage such use and the development of major markets therefor.

(4) To prepare, after public hearings and reasonable consultation with government and other agencies, private companies and associations having a primary interest therein, a plan for the orderly development of Alaska's power resources, which plan shall be amended, revised and expanded as may be necessary to reflect changing conditions and requirements.

(5) To promote and otherwise foster the assimilation of accurate information concerning Alaska's power resources through expanded federal programs for stream gauging and other detailed studies.

(6) To coordinate and otherwise represent the state's interest in securing full federal participation in the development and financing of large-scale, low-cost power projects through the construction of multiple-purpose dams, fossil fuel and nuclear power plants, or otherwise, and the construction and installation of inter-tie and other transmission facilities essential to such projects.

(7) To promote and otherwise encourage rural electrification and the extension of central station electric service in Alaska.

(8) To assist communities, associations, and others to furnish or improve central station electric service by collecting and otherwise providing information concerning technical or other assistance which may be available from federal, state, or other sources for such purpose and by establishing and maintaining a clearing house of information concerning essential materials and equipment available in Alaska and elsewhere.

(9) To encourage and assist in the creation of power grids and power pools to facilitate the efficient utilization of generation facilities.

(10) To cooperate with federal, state, and local agencies and associations or private companies interested in the generation, transmission and distribution of electric power and energy, or in the use thereof, or in the economic and social development of Alaska, including, but without limiting the generality of the foregoing, the Bureau of Reclamation, United States Army Corps of Engineers, Rural Electrification Administration, Alaska Rural Electric Co-operative Association, Alaska Chamber of Commerce, the League of Alaskan Cities, and the Alaska State Federation of Labor.

(11) To hold hearings throughout the state for the purpose of determining public need in the field of power.

In the discharge of the foregoing duties, the section shall cooperate with all federal and state agencies responsible for the conservation, propagation, and development of other natural resources of the state.

SEC. 4. *Study of Laws and Practices; Report to Governor and Legislature.* In addition to all other powers and duties conferred upon the section by this Act, the section shall make a careful study of all laws with the administration of which it is charged and of the practices of state power authorities and similar agencies elsewhere and make a special written report thereon, including recommendations for such further legislative action as it may deem necessary in the public interest. More specifically, such report shall include recommendations with respect to the state's need for a corporate arm with the authority to construct and otherwise acquire, operate, and maintain electric generation, transmission and distribution facilities, and to produce and otherwise acquire, transmit, distribute, furnish, and sell electric power and energy and other incidental services, commodities, and facilities, and the ways and means of financing such activities. The study and report shall further include the terms and conditions under which the section or a proposed corporate arm of the

state may borrow funds from the Rural Electrification Administration for the purpose of furnishing and assisting others to furnish central station electric service to Alaska communities and other rural areas. Such report shall be delivered to the governor not less than 10 days prior to the opening of the first session of the Second Legislature and to the president of the Senate and speaker of the House of Representatives not less than five days after the opening of such session.

SEC. 5. *Proviso.* Nothing in this Act prevents the governor or the commissioner of commerce from integrating the Section of Power Development into a different organizational pattern, nor authorize duplicating engineering, research or similar activities conducted by other departments of the state.

SEC. 6. *Effective Date.* This Act takes effect on the day after its passage and approval or on the day it becomes law without such approval.

Approved April 16, 1960.

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